All at sea? A critical appraisal of the C4 framework for the management of major maritime emergencies (MME)

John Astbury CBE

CMarTech, FRIN, FIMarEST

Student number M00355153

Submitted for module MBS5360

in partial fulfilment of the award of

DProf by Public Works

Middlesex University, London, UK

February 2016

Contents

Figures

Tables

Abstract

This study is the result of nearly four decades of professional practice in the maritime industry and, in particular, dealing with shipping emergencies, including many high profile accidents and several hundred lesser, but potentially life-threatening, emergencies. The study uses this knowledge and experience as a basis for undertaking a critical evaluation of the Command, Control, Communication and Coordination (C4) framework that is typically used in dealing with such emergencies. It begins with a brief history and background to the C4 framework in the context of a major maritime emergency (MME). The components of the framework are defined and an exemplar activity map used to describe the framework in detail and the relationship between its components and external influences.

A preliminary evaluation of the C4 framework suggested that while it is largely robust in principle, there is considerable evidence to suggest that its utility in the handling of live emergencies is frequently undermined in practice. This finding led to a second phase of evaluation, which attempted to identify optimal operational principles that can contribute to a more effective implementation of the C4 framework in major maritime emergencies.

Six command principles (P1-P6) plus one sub-principle (P1a) developed from the author's career are described and used as a basis upon which to build additional principles. To determine these additional principles, seven case studies based on experience and professional practice, are examined to identify key statements and observations of Favourable (F) and Unfavourable (U) practice.

Evaluation and analysis of the key statements and observations led to thirty additional C4 framework principles. A short cross-sectional (latitudinal) survey was also conducted of emergency service professionals to support the professional practice and the principles derived from the case studies. Given the time constraints of this study and the difficulty in maintaining responses over time from all 395 respondents, a longitudinal survey was ruled out. Analysis of the survey led to a further three principles that included qualities required of a commander, and the selection of potential recruits to emergency response organisations, in particular command positions.

The six original principles of command (plus one sub-principle) are matched with extant cognitive decision making studies, together with a limited review of the psychology of decision making outside of the maritime context using real life examples, and evaluated for commonality or otherwise of biases and thinking approach. From these appraisals a further 5 principles were identified. In all, a comprehensive list of 46 C4 framework principles is produced that covers command in terms of people (command, skills and knowledge), Process (Design), Resources (Design), Organisation (Design). The 46 principles are classified under 3 headings: Capability, Readiness, Response, producing 26 consolidated principles under 10 sub-headings. The list is further refined to produce three distinct tables of principles in an operational format that can be used by any emergency response organisation.

The study, which is based on practical experience and professional practice supported by academic research, concludes that the implementation of the C4 framework for the management of an MME can be significantly flawed, and would benefit from the adoption of many of the principles derived from the author's own experiences and also from complementary sources. The study also supports the contention that it is the human element in the implementation of the C4 framework that could be improved and that the framework itself is largely fit for purpose.

The refined principles derived require actions to be undertaken, some more extensive than others, by commanders, trainers, recruiters and managers before they can be effective. To aid this approach, the principles are marshalled into three key groups, as commonly used by emergency services, as described above. The key groups can be used to aid the formation of simulated exercises for training purposes and for organisational design. In summary, the principles identified provide a foundation for improving the implementation of the C4 framework for the management of MMEs, and for emergencies across all other fields and in many other contexts.

Acknowledgements

I would like to acknowledge the advice and guidance given by Professor Ifan Shepherd in the approach taken to this study and for his patience in adapting to my ever-changing mind. I would also like to acknowledge the many people with whom I have spoken during this study who have contributed to my thinking, and have on occasion changed the direction of my work. I would like to express my appreciation to the many people from across the globe that work as professionals in emergency management and who completed my questionnaire and helped support this study and to Professor Uri Schild for his advice on the semi-automation of the Wigmore process and the evaluation of statements. The evaluation of extant cognitive studies was made much easier by the use of the taxonomy produced for the RECOBIA Project and that listed in the paper by Carter *et al*. (2007).

Part I

Setting the Scene

Chapter 1

Context and rationale for the study

1.1 Introduction

This Chapter provides a personal and operational context for the identification of improvements in the implementation of the Command, Control, Communications and Coordination (C4) framework for the management of Major Maritime Emergencies (MME). Whilst some emergency professionals may consider the C4 framework as it stands is fit for purpose, my own professional practice and first-hand experience in the field suggests otherwise. I would agree however that whilst the fundamental C4 framework itself is in the main suitable, its implementation can be flawed and it is this aspect that principally needs to be critically appraised. My contention is supported to a large extent by my survey analysis later in this report – Chapter 5 (although there are more framework issues than I at first considered but not damaging my contention). This study therefore evaluates the components of the C4 framework, as well as its implementation, and seeks to identify flaws and improvements, including the adoption of the principles that I have developed throughout my professional career. The study uses seven case studies derived from my Public Works Inventory (PWI) that have been extracted from my extensive professional experience. The complete PWI is provided as Annex A. The principles I have derived have a practical application in MMEs and within a training environment in preparation for dealing with MMEs and in other emergency contexts.

1.2 Personal Context

Currently I am an aviation and maritime consultant. This began with 11 years in the Royal Marines after which I started a 34-year career in the UK Coastguard Service and Marine Safety Agency, serving first as a coastguardsman in a Rescue HQ and visual lookout station on the Isle of Wight on the South Coast of the England. After the most cursory of local training – basically making sure I could spot a distress flare, answer the red 999 call telephone and speak clearly on the 6 channel radio – I sat six-hour watches over a 48 -hour period followed by a 24-hour period on-call to carry out local coastal rescues; no hardship for a former commando.

The Coastguard Service at the time (1975) was staffed by all male and mostly Royal Naval pensioners with no enthusiasm for change or operational improvement. The order of the day

was to maintain the status quo. This is not a criticism of the men involved but simply a reflection of the pensioner mentality having completed one career over several decades and no desire to repeat the process. Moreover, the job was not particularly exciting for the most part and only became interesting when an incident occurred. During these periods of excitement the temptation to become immersed in, and over-complicate even the most straightforward and simplest of incidents became irresistible. Such over-involvement was completely unnecessary but it broke the monotony of staring across expanses of water. It also caused a few problems when more than one incident occurred at the same time (fortunately, this was not often) as the most interesting ones gained the most attention.

The means of recording incidents in those days was on formatted message forms which held basic information such as date, time, sequence of events and action taken. For the most part the form was re-written after the event to make the incident actions clearer but mostly to make the operator look as though they actually knew what they were doing at the time; additional information was invariably inserted on the final record that sometimes indicated actions that should have been taken but in fact had not. The forms were later reviewed by the officer in charge of the coastguard station and a further more formal report was completed for despatch to Coastguard HQ in London. It was often said that this formal report was more a reflection of how the incident should have been handled rather than the way it actually was.

The C4 Framework as I have described it did not exist as such during my first years as an operations officer. Incidents where handled very much *ad hoc* and on the basis of the officer's past experience in whatever field the officer came from. Indeed, I did not receive any formal SAR or emergency response training for nearly nine months following my enlistment and was expected during this time to take charge of incidents. However, command of major emergencies was taken by the District Officer (3 grades above the watch officer), and if necessary by the regional inspector of coastguards. The control of resources was difficult as the lifeboats and limited helicopter assets were generally controlled by their owners, and often on private radio frequencies which the Coastguard did not have. Moreover, the Post Office Coastal Radio Stations were responsible for the integrity of the VHF and MF distress and emergency radio channels. This situation resulted in a fragmented communications structure which exacerbated any attempt at control, or indeed command

and coordination. As a consequence of disjointed control and communications and an often disparate command structure; it was the standard operating procedure in the 1970's to inform the District Officer of Coastguard when any lifeboats were launched to an incident or if a distress flare had been seen. The response from the district officer was usually to ask what measures had been taken then to turn over and go back to sleep if the incident was in the small hours. Basically, any real decision making was not in the hands of the duty operator, almost everything had to be referred upwards even if the boss was in bed.

As a result coordination was a hit and miss process; vessels at sea would report through the Post Office coastal station and local craft would generally discuss the situation among themselves, on private radio channels, occasionally advising the Coastguard of anything they felt important.

Over the next 5 years, into the early 1980's, the Coastguard Service took on more responsibility – particularly for monitoring the international VHF distress, safety and calling frequency channel 16. With this responsibility came an improvement in technology and the cessation of visual watch a regular or full-time coastguard stations; it was recognised that less than 1% of incidents were identified through a watch officer actually seeing them and even this small percentage was notified to them by other means, such as radio or telephone. Visual watch however continued among the most stalwart of volunteer coastguard stations for some years. The last visual watch station (Lands End) – an auxiliary coastguard station staffed by volunteers – eventually closed in 1994 after many years resistance to change; the local coastguard senior officer in charge actually had to break and replace the locks to the lookout station and dispense with the services of the volunteers due to their absolute resistance to change.

Changes became more rapid in the early 1980's resulting in increased staff levels at coastguard stations, the introduction of more sophisticated radio control systems including direction finding and improvements to standard operating procedures. During this period I contributed to the improvements by writing the Coastguard's first Chemical Hazard Manual which subsequently became the Department of Trade's first such handbook – HazChem. The manual aided coastguard officers identify chemicals shipped around the UK that could cause hazards to seafarers and rescuers alike and arose from an incident I was involved with would have been greatly assisted by such advice. It occurred to me at the time that the Coastguard

Service was becoming a fertile ground for change and senior officers were responsive to new ideas. A training school had been established in the 1970's for all new entrant coastguards and for developmental training but for the most part this formal training was voluntarily and no real assessment was made of progress. So much so the courses became known as deck chair' courses, with reference to the seaside location of the training school. This was to change markedly in the 1980's.

However, many of the coastguard officers who had joined in the late 1960's and early 1970's even with the offer of training courses were left behind and new technologies became a severe barrier to their acceptance of change. For some, even the introduction of the first FAX machines presented a serious problem and on one occasion I recall an incident involving an older colleague who went home after failing to heat his lunch in a new 'fangled' microwave.

Due for the most part to the lack of career interest from my older colleagues, advancement in the Coastguard Service was not too difficult and with my acceptance of mobility I advanced well through the ranks. During my period as a tutor at the Coastguard Training School I introduced many changes involving examinations and structured training courses. It was at this time that computers started to be used in education which attracted my attention with a view to improving the way coastguards searched for missing persons and vessels at sea. Up until that point search areas had been determined using manual methods based upon US Coast Guard processes. It soon became clear to me that computerising what were manual processes was not the best use of a computer and it was necessary take a fresh look at the processes. However, challenging the might of the US Coast Guard was not a task I savoured. Nevertheless, together with a colleague from the Government's then Organisation & Methods (OM) Section we set to work examining the US doctrine.

To our astonishment we found that the processes used by the US Coast Guard were based upon search methods for Carly rafts during WWII; the survival and drift tables also appeared to be based on this data. The US at that time also had a computer based system for search planning called CASP – Computer Assisted Search Planning (Richardson & Disenza, 2006). This was fundamentally a Monte Carlo simulation (Anderson, 1986) based system to obtain the probability of a target (person, lifeboat/raft, vessel) being in a certain area. After visiting the US Coastguard School on Governor's Island, New York it became clear that CASP was

somewhat of an expert system in that no single individual seemed to have a complete grasp of the system but rather individuals were thoroughly familiar with its components.

This realisation led to my being confident that I could develop a computerised search planning system that could be wholly understood by individuals and moreover, required human input to be effective (Astbury, 1987). After several false starts the Department of Trade (and subsequently Transport) accepted the philosophy and the commercialised and computerised search planning model was firmly established within the Coastguard Service. However, all was not smooth running and I soon come to realise that I had introduced a step too far within the system. Whilst I had endeavoured to ensure that operators could understand all aspects of the system it became clear that, what I called, the effort allocation package, was not readily understood by the majority of operators, thus it fell into disrepair. This was unfortunate as I felt it was the most useful part of the system; once a search area had been established based upon multi-scenarios for the incident, the system considered the best approach or effort for the search units taking into account the potential navigation errors of the units. The lesson I took from this was to keep any future system simple and understandable. I had become so immersed in development of the system that part of my *raison d'etre* had been lost.

The limitations of operations personnel became upmost in my mind as my career developed. I was involved in orchestrating and implementing a great many changes, including the introduction of major governmental policies as 'efficiency measures' (Astbury, 1997). Against this background it was important to ensure that whatever operational changes took place those responsible for implementing them understood how to implement them. It also became important to ensure that proper training took place to give operators the necessary skills to carry out their jobs when dealing with emergency incidents. Upon reflection this was not a great success as simple errors still occurred and incidents were not handled as best they might. Whilst the organisation appeared sound the approach to recruitment and selection was hit and miss as were operational processes. Certainly, Coastguard operational procedures were well documented and recruitment and selection was competency based and recruits selected from appropriate backgrounds (military and civil maritime in the main). Nevertheless, I still witnessed occasions, particularly during my review of the Coastguard Service in 1995/96 when operators – even in my presence as Chief Operations Officer –

failed to make an effort to manage even straight forward of incidents. On some occasions the officer in charge of the operations room when an incident occurred left the room and didn't return until a junior officer had initially dealt with the emergency. Clearly, there had been a failure somewhere along the line with recruitment, promotion selection and or training.

During this period I witnessed a major pollution incident being handled by a well-established team but the process that ought to have been adopted failed and the incident resulted in major criticisms and the inevitable questions in both Houses of Parliament. As an observer to these events and the subsequent reports into them, it became clear that whilst the process for such incidents was well documented in national contingency and other plans what was lacking was a single overall commander and clear direction; this was apparent to many other observers and indeed in a report by Donaldson (1994) it was clearly stated that there should indeed be a sole commander for major maritime emergencies and that government ministers should not interfere with the decision process and should either *"back him or sack him".*

In 2014 the Coastguard Service underwent major change involving the reduction of rescue co-ordination centres and personnel. Reliance is being placed currently upon the centralisation of centres into two main centres, north and south of the UK, with several satellite stations revolving around a network of remote radio sites. The management of major maritime emergencies is becoming more centralised with the emphasis said to be on the quality rather than the quantity of personnel. The role of the senior officer in these so called super Coastguard Centres is therefore paramount in the resolution of major emergencies. It is also the case that these centres will be expected to handle more incidents in general, with the potential for more major emergencies. There will also be a need for well-honed and processes and carefully selected personnel, not only at an experienced appropriate senior level, but at the initial recruitment stage to allow a suitable pool of promotion candidates moving toward these senior command positions.

Compared with the C4 situation when I first embarked upon a maritime career technology has vastly improved, there have been organisational changes and processes are more structured. It could be argued that personnel have improved too, however human factors still play a significant part in the successful outcome of MMEs and the implementation of the

C4 Framework. Four decades ago people failed to follow the, then, concept of operations (CONOPS, Chapter 4) and this still occurs today regardless of the sophistication of the technology in use.

It is against this background that this study is undertaken and provides my motivation for the development of recommendations for improvement to the existing state. My selection of work within my PWI (Annex A) forms the basis of my research together with other experiences and current and past professional practice (see also Chapter 1). The seven cases identified in my PWI for analysis and evaluation are:

- Case study #1 MT Prestige incident in the Bay of Biscay 2002
- Case Study #2 MSC Napoli incident in the English Channel 2007
- Case Study #3 The Al Salam Boccaccio incident in the Red Sea 2006
- Case Study #4 Multi-tank Ascania incident off the coast of North Scotland 1999
- Case Study #5 Establishment of the UK Maritime Incident Response Group (MIRG) 2003
- Case Study #6 HM Coastguard 5-Year Strategy Focus for Change 1998
- Case Study #7 Proposal for a JRCC HQ in Qatar 2009

These cases were chosen to reflect a range of experience that covers the aspects of MME management and the C4 framework under investigation. They include major maritime emergencies with which I was directly involved either as part of or leading the operational team (MSC Napoli and MT Ascania), as an expert witness over 4 years in the case of MT Prestige and adviser to the IMO and Egyptian Government following the Al Salam Boccaccio tragedy. The PWI selection also includes operational organisational change and development (Coastguard Review and JRCC Qatar), resource acquisition (MIRG) and training (MME and Marine Investigation).

1.2.1 Personal Principles

My motivation for pursuing this study is to identify principles I have adopted in my operational career and professional practice that could lead to improvements in the implementation of the C4 framework and its operating environment. During my career, I have evolved six principles that I have progressively adopted and which have proved successful in implementing the C4 framework during maritime emergencies. They are:

P1 Don't make decisions or act upon them until you have to – hasty decisions and actions can result in disastrous consequences. If you have time use it; often there isn't time and decisions in an emergency need to be made quickly.

P2 Don't dither and procrastinate when making a decision – opportunities for action may be lost.

P3 Consult team members and attempt to reach a consensus if there is time about options for action and accept that as a commander you don't, and cannot, know everything. But remember that a decision has to be made and it is you who has to make it.

P4 Learn to fail and avoid a continuing commitment to a decision that is being proved wrong – be courageous and be prepared to take a different path.

P5 Pre-determined plans can be useful tools at the outset of an emergency but avoid any plan that attempts to take you through a scenario.

P6 Take every opportunity to gain operational experience, however small – it will build intuition and improve heuristic responses when making decisions under pressure.

In the following paragraphs I discuss each principle with some background and examples to emphasise how the principles arose. Clearly the examples are not exhaustive as the principles have evolved over a great deal of time. When I have reflected upon my career I have been conscious of many other potential principles that could be applied to the improvement in the implementation of the C4 framework but which I have not articulated. They have been, in a sense, background ephemeral principles that could from time to time be applied to the management of an MME, its C4 framework and environment but have not obviously provided a consistent source of functionality for all MMEs I have managed. It is these additional principles that I sought out from within my case studies (Chapter 4) to produce a comprehensive set of C4 implementation principles. This was achieved through the determination of key statements and observations.

My choice of case studies is based upon my desire to include a range of events that best aided my career evaluation; four operational incidents, one that was considered a success of C4 implementation (Napoli Case Study #2), another that was considered a failure (Prestige

Case Study #1), one that was an eventual success but hosted a range of political issues (Ascania Case Study #4), one without any recognisable C4 framework (Al Salam Boccaccio Case Study #3) and three studies that involved the environment in which the C4 framework operates: Case Study #5 People and Resources, including political and cultural aspects, Case Study #6 organisation, people, processes, rank and culture, and finally Case Study #7 Organisation, people, processes, politics and culture. I was personally involved in all the cases. I could of course have chosen a range of emergencies that I have personally handled but these would only have led me to evaluate a limited number of aspects of my study.

Additionally, certain of my six principles comprise command characteristics that I wished to test with other practitioners and this was achieved through a brief survey (Chapter 5). I have also sought out principles by matching these command characteristics with current constructs in cognitive decision making studies (Chapter 6). This has resulted in further principles which, together with my initial six (one of which gained a sub-principle) produced a comprehensive list of 44 principles to improve the implementation of the C4 framework within the context of an MME.

The above six principles have provided the foundations of my response to an MME, and the starting point for my study. They have been derived from my experience in managing hundreds of minor and major maritime emergencies in command throughout my career. Clearly the principles did not simply pop into my head after the first tranche of day-to-today emergencies or the first MME I commanded, instead they resulted from handling numerous and varied minor emergencies punctuated by MMEs and a great deal of reviewing of my actions and learning from my mistakes over several decades, and I am still learning. Failures were an important feature in the development of my principles and achieving the balance between taking a course of action that led to a successful outcome and those which resulted in unfavourable outcomes. My definitions of Favourable (F) and Unfavourable (U) are:

> Favourable (F) Practice: Procedures, practices, protocols or organisational issues that are considered advantageous to the chances of a successful outcome;
>
> Unfavourable (U) Practice: Procedures, practices, protocols or organisational issues that are considered disadvantageous to the chances of a successful outcome.

It is this judgement that I use to evaluate my case studies (Chapter 4). Moreover, not all six principles found their way into my list at the same time. Indeed it is difficult to say in which order they appeared, and their order of importance, as the emergency in question will dictate their nature of importance or role that they play. For example, it can be obvious in some emergencies that the initial information received concerning the distressed status of the ship is all that is likely to be available if the ship sinks within the first ten minutes of an alert and loses all communication; on the one hand this situation can enable a commander to make an immediate decision about the assistance that is needed providing the location is clearly known, on the other hand it may prove problematic if the position is not clearly known –making decisions about the course of action difficult. The point here is that not only does an emergency, major or minor, dictate which principles are relevant but also the extent to which they are applied.

The fundamental principles have been added to and developed over time and refined. But even with refinement the principles are not perfect and cannot be taken as an absolute guarantee of success. I learned over time not to act hastily but to still appreciate the urgency of a situation. The temptation to believe that a previous success delivered a recipe for future successes was also in my catalogue of unsuccessful outcomes. I ought to have been aware of Kipling's poem *If* (Eliot, 1945) and treated both the failure and success 'imposters' just the same. I was advised at the outset of my career not to assume anything and not to jump to conclusions about the information received in response to an emergency. However, as with most things in life, it is a wise man that learns from other people's experiences when advice is too broadly given and I found myself doing the opposite in both cases; this is discussed further below.

I recall recently reading an interview with lawyer Victoria Loh (Globe & Mail, 2013) when asked what advice she would give to colleagues following in her career path. The title of the interview was *Learn from the mistakes of others.* Summarising the interview Loh said in response to a question about advice: "*A big part of this career is learning by trial and error, so keep humble. You're not going to know everything. If you mind your manners with everyone, you might be able to get advice from people who know more than you and who knows – maybe even a referral."* I regret that for the most part I never took too much advice in the early days and preferred to learn from my own experiences. It may be that specific

advice in the form of simple principles that commanders and operators can relate to will be better received by those within the emergency management field.

At the outset of my career as a junior officer I was able to command minor incidents. I tended to wait until what were termed the vital facts about an emergency were available; the teaching at the time was to identify the most important information first – location, type of vessel and type of the incident, number of people on board the vessel and type of assistance required. These headings were listed on an incident response form primarily to prompt the operator to seek the information. I considered these vital facts each time I was faced with an emergency and found the form to be a very helpful aide memoir. However, over time my first principle, P1 (don't make decisions until you have to) emerged. Often I would find myself making decisions once all the vital facts were known, but my assumption was that the facts were all accurate and that once armed with them, regardless of whether I had time to consider other information, I tended to take action. On one occasion, having assumed that the location of the emergency was accurate, I despatched a rescue craft in the wrong direction. Once this was realised by another officer and the rescue craft directed to the right location, time had been lost but fortunately the mistake did not prove fatal. On this occasion my assumptions and haste had failed me. I became aware of the need to assess available time when dealing with emergencies and the need to make sure of my facts. It is not always possible to wait until all the facts are checked and re-checked before taking action so it is important to distinguish between unnecessary haste and unnecessary delay. Having experienced the former and failed I became conscious of the need to evaluate emergencies more closely in terms of the time available to act. It was not long until, by hasty experience, I delayed a decision until I was absolutely sure of my facts only to cause an unnecessary delay in the rescue of several yachtsmen in the English Channel. I concluded from these experiences that there is no easy answer other than to adopt P1 and to take more care in balancing speed of action against unnecessary haste.

Gaining experience and the development of my intuition (more of which later in this study) much improved my confidence. However, having carefully evaluated, or so I thought, the information I received about drifting debris from a cabin cruiser in the Western Solent, South Coast of the UK, I considered I had all the relevant facts and had adopted the right approach so despatched rescue resources in an attempt to find the crew having determined an

appropriate search area. The debris with the craft's name showing provided clues to the identity of the crew, or so I thought. Having tracked down the origin of the boat I discovered that two men from Poole, Dorset, had taken the craft on a trial run before deciding whether or not to purchase it. The location of the craft when it sank should have provided adequate data for a search plan. Evidence of the sinking came from a member of the public who said they had observed the craft hitting something and capsizing. Eventually, one crew member was found, not as a result of my search, but by the local police on a beach some miles away from the alleged sinking position. The located crew member was an escaped prisoner from Parkhurst Prison on the Isle of Wight, as was his colleague. They had stolen the boat and intended to go to France but the weather had apparently got in their way. Having realised they would not be able to make it to France they had decided to leave the boat to the elements and create a diversion knowing the Poole sales office would eventually report the men and craft missing. The member of the public who reported the incident was in fact the other crew member who reported a false position to allow the men time to escape. My error was to take all information on face value and to act in haste simply because the situation appeared extremely urgent. Had I taken more care and considered the information received more carefully I would have realised that the debris was found in the opposite direction to that reported for the capsized craft as dictated by the tide and wind drift. Had I just waited for several minutes and considered the information to hand rather than jumping the gun it would have occurred to me that something suspicious was happening. The outcome was that several rescue resources were deployed in extremely difficult weather conditions and doubtless a risk to the lives of the rescue teams. I can still recall having a nagging doubt in my mind about the situation but did not stop to think it through. In terms of my P1 the difference between acting immediately and delaying my decision, and evaluating the information more closely, by only several minutes, would have made all the difference to the outcome. As my confidence grew the intuitive voices in my head became clearer and enabled me to make clearer judgement calls. In MMEs there are opportunities to reconsider available information and they should be taken; the outcome if mistakes are made in an MME can result in catastrophic consequences, as occurred in Case Study #1 (Chapter 4). Upon further reflection I have added a sub-principle P1a to my list about reasons for delaying decisions (Chapter 6) which I discuss later in this study.

Principle P2 (don't dither and procrastinate when making a decision) arose initially from witnessing commanders who could not make a clear decision. For example, a very senior official in the, then, UK Department for Trade (now Transport) when dealing with the *Christos Bitas* emergency in the Irish Sea in 1978 (Ships Nostalgia web site, 2016) dithered about when and where to sink the stricken tanker; the ship was carrying a small amount of crude oil having been lightened at sea of some 27,000 tonnes earlier before being towed from shore. The official could not make his mind up with the result that the salvage master took in to his own hands and getting bored with towing the vessel around the Irish Sea decided to sink the vessel there and then. The Departmental official found out about the sinking from the television news. I was in the operations centre as a junior officer when the TV news came on and was stood just behind the rather embarrassed official. Clearly any considerations being made by the government officials were overtaken by events.

On another occasion I served with a colleague who tended to avoid making decisions and to rely upon others to guide him. I witnessed him on several occasions when I was due to take over command from him when emergencies were running. Instead of carrying out a proper handover he couldn't wait to leave the operations centre. In more than one case I was left to be briefed by his subordinates only to be told that my colleague thought it might be better if any important decisions were left to me at the start of my duty period. Although none of the situations resulted in unfortunate consequences they could easily have done so had not his subordinates intervened and ensured that vital steps were taken. Nevertheless, I found myself having to cover any shortfalls.

I also had the unfortunate experience of working for a senior officer who transferred his dithering attitude in an administrative context to the operational environment. It was said that if you went into his office for a decision at nine 'o'clock it would stand only as long as someone else didn't come in later and seek a different solution. His mind changed as often as the number of people who sought a decision. The trick, it was said, was to seek at decision at the end of the day. The senior officer concerned when faced with operational decisions consulted extensively throughout an emergency and changed his mind so often that operational teams became confused and held their own meetings to decide on a way forward. This leads me to my principle P3.

Principle P3 (consulting others) has been with me throughout my career as a natural process. I feel that I am a natural consultor. However, it has taken time to appreciate the importance of not delaying a decision on the altar of consultation or by driving to reach a consensus before taking action. I often found myself overtaken by events, albeit marginally, whilst trying to take in everyone's views. Ultimately I realised that consultation and consensus is fine but a decision has to be made in time for it to do any good. More than 20 years ago as a senior officer I was invited to carry out a review of Coastguard incident statistics following a number of failures and complaints through the media about Coastguard delays in dealing with emergencies. It shocked me to uncover a catalogue of incidents that hosted what I classed as unnecessary delays in taking action through consultation. I discovered that the trend flowed from the, then, management training doctrine which taught the necessity of consulting the operations room team and the importance of reaching consensus before reaching a decision. The training had been designed and implemented by non-operational tutors and originated against the need to make coastguard managers more responsive to the needs of their subordinates. Unfortunately, the training had no operational context resulting in more than a few officers transferring their new found consultative skills into the operational environment. It appeared that what was considered 'immediate' or 'urgent' in decision making terms by administrators could be translated into days or even weeks, and this translation read across to operational situations where immediate or urgent means 'now' and not some time later. In essence it introduced a management concept that drove operational personnel around in consultative circles until a consensus was reached which could take several hours or more. The idea that a manager (commander) needed to recognise the time for making a decision and then make it did not feature in the training doctrine, thus this vital aspect was omitted resulting in operational errors.

Of all my six principles I have found P4 (learn to fail) the most difficult to apply. I have always wanted to see things through once I have made a decision, regardless of pressures or advice to the contrary, and I have always been conscious of my reputational risk if I changed my mind midstream. Indeed, I see this as potentially cutting across my principle P2. I have adopted this stance in my private as well as my working life and, on some occasions, I have failed to listen to the intuitive voice in my head that tells me to stop the course of action and to reconsider (see also P1). It is a difficult path to tread, on the one hand to be decisive and exhibit positive leadership and on the other to be courageous and have a change of mind

when it is appropriate to do so. I have found that the application of this principle comes with much experience and not all commanders are able to apply it and instead plough on with failing decisions regardless of the consequences (Case Study #1, Chapter 4). It is often said that there is no substitute for experience and it is certainly true when managing MMEs and adopting principle P4.

In 1996 I was involved with the Sea Empress MME off Milford Haven, Wales (Edwards, 1996). The incident is recounted later in Chapter 2. At the time, the UK Coastguard Agency comprised two separate elements, one dealing with SAR and the other dealing with counter pollution (CP). Although both organisations were under the command of a Director of Maritime Emergency Operations (DMEO), the personalities involved resulted in two disparate and mostly unconnected bodies. The MME developed over time with the ship involved being moved from one place to another, leaking oil in its path. It was clear to many of those observing developments that the advice of local pilots to re-float the vessel (she was aground on rocks at the entrance to Milford Haven) at the earliest opportunity and to lighten the ship of her oil cargo out at sea was the most appropriate under the circumstances. Instead, the ship was towed off the rocks and taken into Milford Haven releasing over 70,000 tonnes of oil into the sea and environment. Following the initial attempt to re-float the vessel the first decision could have been reversed, but was not. This view is of course with the benefit of hindsight and, to be fair to those in command, a great deal of pressure was brought to bear to bring the ship into Milford Haven. This is in contrast to Case Study#2 (Chapter 4).

My penultimate principle (P5) (avoid plans that require working through a scenarios) was initially determined from my experience dealing with offshore installation emergencies some three decades ago. At the time, the oil and gas sectors in the North Sea were colour coded. The sector under my jurisdiction was the Blue Sector. Having just arrived from a London posting I was faced with an offshore oil/gas installation emergency in the southern North Sea. I was advised to review the emergency plans for the installation involved which was to be found in the overall Blue Sector Emergency Plan. The ‘Plan’ comprised several large A4 ring binders bulging at the seams. The emergency plan for the installation in question comprised a range of scenarios, none of which applied to the case in question. There were several hundred diagrams of the installation and its operation, none of which were any use

to an emergency commander on the shore. I concluded that a simple 'Plan' would have been helpful at the outset that comprised roles and responsibilities and contact arrangements rather than a voluminous catalogue of complex and confusing diagrams and technical details. At subsequent meetings with industry safety representatives we agreed on a simpler approach – indeed an 'all hazards approach' and not a scenario-driven one; the emergency response document was reduced to roles and responsibilities and contact arrangements to ensure that the right people could be contacted for a whole range of emergency types or scenarios.

In stark contrast to the oil/gas industry's initial approach to emergency planning, the UK Home Office produced a document called Dealing with Disasters (1990, 2010) that identified all those bodies responsible for dealing with disasters in and around the UK and set out basic principles. This approach is the way in which I have approached emergency planning and it has provided a useful tool for many other organisations. The approach also allows for optimum flexibility in the management of emergencies by not constricting the commander's options. For example, when I developed my computerised SAR planning model[1] it included the facility to deal with multi-scenario situations. A maritime emergency can involve a range of possible initial situations – a drifting vessel or ship's lifeboat, a person in the water, a life raft and so on. At the outset of an emergency the commander may not know what scenario they are actually dealing with so the planning approach they adopt may be a combination of possible situations. A single scenario plan is unhelpful in this context. The situation is like playing the SAR version of Russian roulette in reverse, in the hope that the chosen option out of several is the right one.

I mentioned earlier in my brief discussion of P1 how my confidence in handling emergencies improved over time with experience. My principle P6 (gain operational experience at every opportunity) encompasses to some extent all my other principles and, in particular, P1. This may appear obvious: that more experience will improve performance. However, learning from an experience is not the same as simply having the experience itself and should be taken into account when adopting principle P6. Throughout my career I have met individuals who have had very many experiences but apparently learned nothing from them. On the

[1] SAR Planning model is a computer model to enable commanders to consider multi-scenario situations and ensure that the subsequent search plan covered all chosen scenarios.

other hand there have been individuals that have learned a great deal from very few experiences. It is important therefore not just to have an experience but to gain from it and to contextualize it into new situations.

I mentioned earlier my experience as a junior officer in London (the Christos Bitas incident). During this period I was exposed to the machinations of senior government officials and their inexperienced approach to MMEs. A few years later I worked as a staff officer in Coastguard HQ in London and was exposed to ministerial protocols and procedures, accompanying ministers on visits to coastguard centres, briefing them and gaining an insight into their briefing needs during an MME. On one occasion I was involved with the Herald of Free Enterprise MME (MAIB Report, 1987) and the then Secretary of State for Transport. He insisted against advice that he would visit the port of Dover to meet and greet the survivors from the disaster although he was told that they would mostly be flying back and were not minded to get on another ferry so soon after their traumatic experience. Nevertheless he went to Dover, wanting to be seen by the media. Needless to say, he was a very lonely man at the port whilst the media were present at various airports interviewing the survivors. The prime minister took a rather dim view of his performance and he was shortly thereafter replaced. This incident gave me an insight into the desires and priorities of politicians during an MME and the need to ensure that they are addressed without interfering with the MME conduct. I say more on this in my discussion of Case Study#4 (Chapter 4).

1.3 Direction of travel

Figure 1 sets out the route taken to seek out improvements in the implementation of the C4 framework with the steps discussed briefly below and elaborated upon in future Chapters as indicated. The study is presented in four parts.

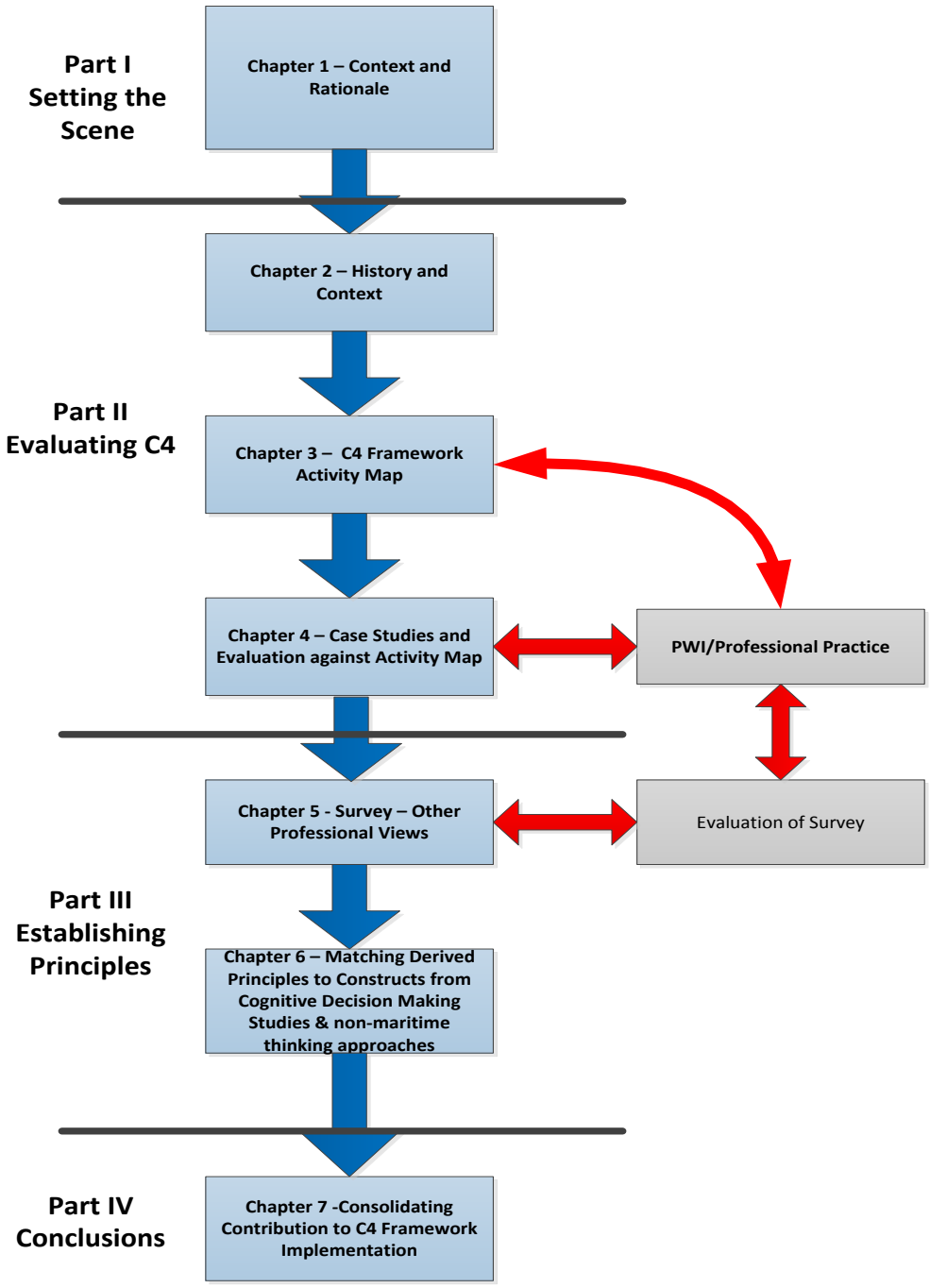


Figure 1 - Charting the Study (source author)

1.4 Operational Context

Before embarking upon the study I felt it necessary to define the MME system under consideration as it applies to the C4 framework. The Maritime and Coastguard Agency

(MCA), which comprises the UK Coastguard Service, defines a major incident as one which requires the implementation of 'special arrangements' i.e. a Major Incident Plan (MIP). The primary consideration is whether a normal response is likely to be sufficient. If it is not, then an MME is declared. A summary of risk types identified as being potential major incidents include:

- *"the search for, or rescue of, large numbers of people e.g. from a passenger ship, an offshore installation, an isolated area, or many small craft in distress simultaneously;*
- *the release, or potential release, of hazardous, noxious or polluting materials at sea or along the coast ;*
- *the effect of an emergency situation on the responsible State body and/or its partner organisations' own staff, facilities or infrastructure, limiting the ability to respond.*

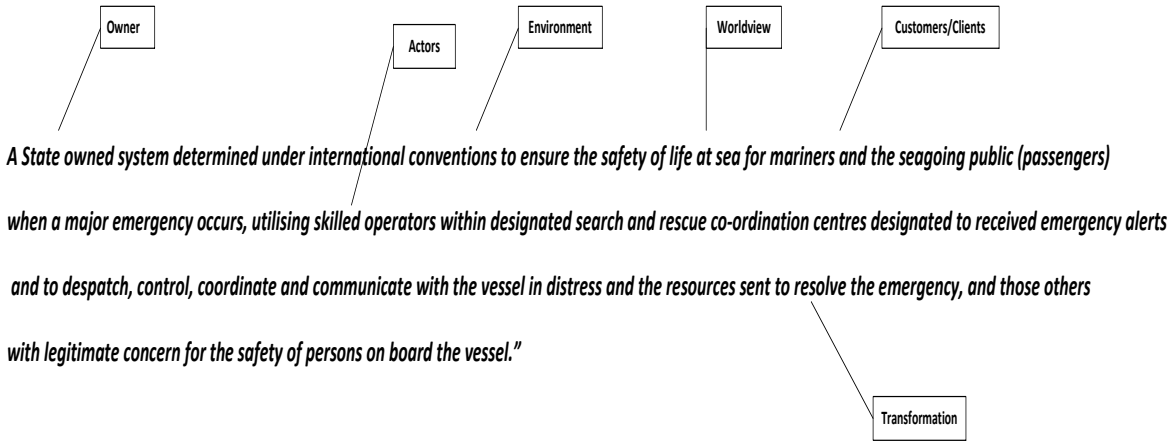
  NOTE: in remote areas, a major incident response may be required even if the number of people to be rescued is relatively small, for example when there is a significant environmental impact, such as a chemical or oil spill in highly sensitive areas."

An MME requires a C4 framework to support a successful outcome in all risk types. Each of the C4 framework components requires an operational synergy, which includes an element which is not always present even within the most developed maritime emergency response organisations: the human interface. For example, an organisation can boast the most sophisticated array of modern communications, and a seemingly competent workforce together with a wide range of readily available resources, but if the human ingredient fails through inadequate training or indeed personnel recruitment and selection in the first place the entire C4 framework can collapse with disastrous consequences.

There are a variety of definitions that are applied to the components of the C4 framework. The definitions set out in subsequent sections are those that are used throughout this study that are used principally by the UK Coastguard Service and defined for use in MMEs (Dealing with Disasters, 2010) together with additional explanatory points.

A root definition for the MME C4 framework is established (Checkland & Scholes, 2001) taking into account the background and context for the study. Some aspects of Soft Systems Methodology (Checkland 1960, 2001) were used to derive the Root Definition set out below.

"Major Maritime Emergencies (MME) and C4 Framework



The CATWOE acronym (Checkland, 1960) was used to determine the above definition: Customers/Clients = mariners and seagoing public: Actors = skilled operators in rescue coordination centres: Transformation = resolving the emergency: Worldview = making the sea a safe place for the customers: Owner = the State at national level: Environmental constraints = International Conventions and the sea and the system within which the skilled operators work.

Chapter 2 gives a brief history and background to managing an MME and the C4 framework and how it has evolved since its inception. It describes the C4 components, operational context and definitions. The Chapter sets the scene for the study and describes how the human element can impact upon the C4 framework implementation.

In Chapter 3 I have used my root definition as the basis for forming the operational context for managing an MME and the implementation of the C4 framework and as a basis for mapping its associated activities into an exemplar activity map. The activity map (Figure 6) sets out the high level interactions and operational tasks between six aspects of the framework: people, process, resources, and organisations, political and cultural influence and is used to evaluate my case studies and professional practice. The C4 framework set out in the activity map is based on Soft Systems Analysis (Checkland & Scholes, 2001). The

rationale for choosing a soft systems approach is that this approach has been used by the MCA in their analysis of Coastguard Service operations to improve operational procedures with a view to rationalising operations centres and their personnel (Future Coastguard Project, 2012). The outcomes from this study may therefore fit with, or be of benefit to, that project. The activity map was populated taking into account currently documented professional practice and from my own experience.

In Chapter 4 I critically appraised the case studies from my PWI to provide a detailed understanding of how C4 framework and related components functionality. From the appraisal I derived key statements of Favourable (F) and Unfavourable (U) practice in the implementation of the C4 framework. These terms are explained in Chapter 1.

To complement and support or otherwise my analysis I conducted a limited survey of 395 emergency service professional from around the globe using a business networking site and a commercial survey package. The results are discussed in Chapter 5. The survey was used to gain the opinions of professionals about certain operational practices and qualities of those in command as they apply to the C4 framework and the management of major emergencies. The survey carries a health warning in that it does not cover all aspects of the C4 framework and includes a wide variety of professionals from all types of emergency organisation and not confined to maritime operations. Within the survey some aspects of my principles of command were included (see Chapter 1 Personal Context). To some extent the survey captures 'what other people think' about MME and aspects of C4. It would have been arrogant of me to suggest that I alone could suggest improvements to the implementation of the C4 framework without testing my beliefs against others, albeit in a limited way.

The C4 framework can be a complex and diverse set of components and sub-components which are underpinned by many aspects of human behaviour and consequently differing opinions and approaches. Therefore, as this study considers that the success of the C4 implementation depends largely upon human factors I have conducted a matching exercise with my personal command principles with extant studies in cognitive decision making, together with other real life thinking approaches. (Chapter 6). Whilst very much a layman in the field of cognitive decision making, the exercise proved valuable to my understanding of the principles I have adopted throughout my career and introduced additional principles that could be of use in the implementation of the C4 framework.

Finally, all aspects of my study are brought together in Chapter 7 to form what I consider to be my contribution to improving principally the implementation of the C4 framework, and supporting components. The data is organised in such a way as to bring together a comprehensive set of principles under three classifications that can be applied in the management of an MME across all aspects of the framework, and in other types of emergency.

The material evidenced in each Chapter by its nature comprises varying degrees of subjectivity. For example, my personal experiences and interpretations of case studies are subjective but comprise some objectivity based upon known facts. Any second-hand or anecdotal evidence that I have recorded should be treated largely as subjective. Overall, another researcher may reach different conclusions and may have derived different key statements and observations from the material I have evaluated.

Part II

Evaluating C4 – My Professional Practice

Chapter 2

A Brief History and Background to Managing MMEs and the C4 Framework: Components, Context and Definitions

2.1 Brief Historical Background

Since the world's waters were first used for trade, exploration and leisure there have been maritime emergencies in one form or another. Amongst them there have been those that can be classed as Major Maritime Emergencies (MMEs).In recent times, not until the *RMS Titanic* tragedy in 1912 with a substantial loss of life (1514 passengers and crew) (Haws 1990) did those responsible for maritime regulation start to take notice of the need to improve safety at sea through design, safety procedures and practices. The regulatory response to the *Titanic* tragedy was the Safety of Life at Sea Convention (SOLAS) in 1914, updated regularly since[2] to maintain safety at sea in the maritime spotlight. Although such updates have focused primarily on the 'hardware' of safety rather than the softer underbelly of the 'human element', it is fair to say that the International Maritime Organisation (IMO) has made many attempts through debates, resolutions, training protocols and procedures to address the many facets of human element influence. The effort in improving the safety of ships through design, construction and technology and, arguably to a lesser extent, improvements in the training and certification of seafarers has primarily been focused on preventing accidents in the first place.

In line with these advances in shipping safety coastal states have been encouraged to establish measures for dealing with maritime emergencies, including MMEs. As expected, the IMO has taken the lead in this encouragement through the creation of international search and rescue (SAR) regions[3] and the introduction of procedures and manuals as good practice for the success of emergency management. For the most part, these procedures and practices also reside in the SOLAS Convention, with the exception of SAR procedures for aviation and maritime which reside in the International Aviation and Maritime SAR Manual (IAMSAR). The establishment of measures to deal with maritime emergencies has led to the concept of Command, Control, Communication and Coordination as components to understand the interaction of those involved in the emergency's resolution. I refer to this as the C4 framework, and I explore its uses within this Chapter together with the contexts in which it resides. I also attempt to provide some history for the evolution of the C4

[2]The International Convention for the Safety of Life at Sea (SOLAS), 1974
[3]Coastal States have been assigned, with their agreement, coastal and sea areas in line with their ability to respond to maritime emergencies.

framework, and provide some much-needed clarification of its component elements, and their sometimes complex inter-relationships.

Whilst improvements have been made to the management of maritime emergencies, its processes and practices, the main focus has been on shipping safety. I would not disagree with the concept of prevention is better than cure, and it would be wrong to suggest that IMO is not interested in improving the management of maritime emergencies or its C4 framework. However, the main emphasis does not appear to be in the area of emergency resolution, and many member states are largely left to their own devices and initiatives in this regard; emergency resolution appears to be largely a matter of guidance whereas safety is a matter of legislation and regulation. There have been many international working groups that have improved procedural handbooks and emergency management processes over many years, but sadly in my experience the approach that has been adopted has been led by well-developed countries and has left many other less-developed member states of the IMO behind; some further than others. The starting point of many of these less-developed member states is far behind those who tend to take the lead in IMO policy debates so catching up is almost impossible. With the rapid advance of technology this situation is exacerbated.

If the implementation of the C4 framework in the context of MME works it is applauded as a resounding success regardless of any failures. As long as lives are saved and the environment is protected lessons that could be, or are, learned are seldom taken up. Moreover, it is never seen as the State's fault that any emergency occurred in the first place; many emergencies involve foreign ships off foreign shores and do not belong to the coastal state responding to the emergency so they typically take the view that they are not responsible. This view has to some extent protected member states from too much criticism and from the need to improve the implementation of C4, particularly if they belong to the less-developed category. Indeed in the UK it has only been over the last couple of decades or so that Marine Accident Investigation Branch (MAIB) reports have included the actions of the UK's responsible authorities in managing MMEs; this was principally brought about by the independence of the MAIB by a change in its constitution and absolute separation from any other part of the MME authority, the Department of Transport's Marine Directorate – in particular the Coastguard Agency (now part of the MCA). Since this change, criticism of the

management of MMEs, and the implementation of the C4 framework, has tended to be focused on procedural failure and not specifically on the human element. I argue that itis the effective and efficient interaction of the human element in the management of MMEs and in the implementation of the C4 framework that results in success and not directly the use of sophisticated technology.

2.2 The Evolution of the C4 Framework and its Components

I start this section with standard dictionary (Penguin, 2000) definitions of each of the C4 framework components as a prelude to discussion.

Command (*v*):	to direct (somebody) authoritatively; to order them;
Control (*v*):	to supervise and direct (something);
Communicate (*v*):	to convey knowledge of or information about (something); to make it known;
Coordinate (*v*):	to combine (diverse elements) into a common action; movement or condition; to harmonise them.

It is perhaps no surprise that two of the components of the C4 framework, Command and Control (C2), have their origins in the military environment; C2 is standard terminology within military operations (Dictionary of Military and Associated Terms, 1989). However, as pointed out by Pigeau and McCann (2002) it is somewhat ironic that the military, having given birth to a massive lexicon of terms for its day-to-day activities, appears consistently unable to abide by their meanings – and this includes C2. From their research Pigeau and McCann (2002) concluded that there is a deal of confusion over use of the term C2. I agree with this conclusion; the word command appears inseparable from the word control regardless of the context in which it is used, without the user fully understanding what it actually means. Command in itself appears self-evident and is generally understood as the function of taking charge and making decisions. Control, in contrast, does not have a universal understanding and, when combined with command in C2, can raise misunderstanding in the minds of users and across user communities, particularly where military and civil resources are working together as in the case of MMEs.

In recent decades with the development of computer technology the components of C4 have expanded into Command, Control and Communications (C3), Command, Control and Computers (also referred to as C3) and C3i –Command, Control, Communications and Intelligence (also C2i – Command Control & Intelligence) and C4 istar - command, control, communication, computer (C4), and intelligence surveillance, target acquisition and reconnaissance (istar); there is also a C4 combination- Command, Control, Communication and Computers. In essence then all the components – except Co-ordination - of C4 in the MME context exist independently of each other or in some combination. The concept of C4 as I describe it as a framework is uncommon. However, I recognise that there are more combinations; the StarBriefs Plus Dictionary (2004) list over one hundred combination that include command and control. Such combinations include: C4 – Command, Control, Coordination, and cooperation; C4iSR – intelligence, surveillance & reconnaissance; C3iSREW – intelligence surveillance, reconnaissance electronic warfare (Technology focus); C4i2 – Command, Control, Communications, Intelligence, and Interoperability, and C5i – Command, Control, Communications, Computers, Collaboration and Intelligence. I do not feel that they will lend anything directly to this study as they are variations on the C2, C3 and C4 models. Nevertheless, where they may be relevant I have mentioned them.

My research suggests that the co-ordination component of the C4 framework is largely limited, but not exclusive, to maritime operations and is generally confined to the C4 framework approach adopted by coordinators of maritime emergencies.

Shaw (1980) cites Conley, 1979) and makes the point that C3 (command, control & communications) is *'all things to all men'* and reinforces the comment by going further saying in his view, *"…once one gets beyond vague definitions such as 'Command and Control is running the show' there is sometimes little similarity in the way individual writers use the concepts of C2 and C3".* It would seem that over the span of three decades three researchers (Albert, Hayes and Shaw) each concluded that C2 and C3 were not really defined in people's minds with any degree of commonality. In my view this is still the case at the time of this study and is likely to remain so given the expanding nature of the C2 construct into many variants.

The C4 framework has many components and forms to some extent what Law *et al,* (1998) calls a multi-dimensional framework, although I have chosen 'component' rather than'

dimension', and it is this concept I have adopted for this study. I define Framework in the context of C4 as a structure linking the components of C4 that comprise the actions or tasks that are taken within the context of an MME to successfully resolve the emergency. However, not everyone considers C4 as a framework and more often than not the approach to dealing with emergencies *per se* is restricted to C2 with Communications and Co-ordination being relegated to subordinated but related components. Each aspect of C4 has its own sub-components, for example, Command has sub-components of decision making, judgement and information assimilation; these can be broken down further into lower level, albeit important, activities. These subordinate lower levels will be considered when I first determine high level activities associated with the current C4 framework (Chapter 1 Approach to the Study).

I have always understood control to be the control of resources or assets engaged in an emergency response, and not to be confused with their coordination. Dedicated [4] SAR lifeboats, military aircraft and additional *ad hoc* facilities such as ships in the vicinity of the incident belong to a variety of owners and their control rests entirely with them until such time as they come under the coordination of the MME commander. If, for example, a lifeboat authority does not wish to commit one of its lifeboats to an incident, or wishes to recall it from the scene, it is at liberty to do so. Similarly, the military may decide in the midst of an emergency that another more urgent case or military need has arisen that requires their resources elsewhere. This is my understanding of control in the context of C4 and it is distinct and separate from coordination.

Control in a maritime context can cause a fragmented approach to C4 by potentially splitting communications between the command centre and the assets involved in the emergency; aircraft or rescue craft owners invariably retain communication links with their assets during the course of an MME which can be to the detriment of communication between the resources and the MME command. This can also occur between the master of a stricken ship and its owners who may be many miles from the emergency but insist on giving instructions to the master about decisions on salvage, evacuation and so on without the knowledge of

[4] Dedicated facilities are those provided by organisations dedicated to the task of SAR, governmental or private.

the command as occurred during the Prestige incident (Case Study #1Chapter 4). Thus the situation described by Beer (1975) as decision making at several levels is prevalent to MMEs.

For the purposes of this study, and in the context of C4, control concerns the oversight of resources by the body that owns them when they are involved with an MME. The term is inexorably linked with command as C2. However, as Pigeau and McCann (2002) discuss, the control definition uses concepts that are part of the definition of command and the definition of C2 appears to be a longer restatement of the definition of control. It appears to be that the definition of control is therefore somewhat circular and it is unclear in military circles from which the definition of C2 arose. As Pigeau and McCann (2002) conclude that there is little consensus among the military or research communities on the actual definition of command and control, C2. I concur with this conclusion in the context of civil usage. The term C2 is commonly in use but its users tend not to delineate between either of the components of C2, and tend to see C2 components as inseparable.

Reviewing C3 (Command, Control, Communication) in a civilian context, the UK Foreign Office (FCO) considers C3 as an operational function for dealing with worldwide emergencies and other crises. The focal point of C3 for the FCO is communications. It considers its C2 centres as portals for the receipt of communications. It does little in the sense of C2 as would a military or civil maritime commander but uses its centres to direct resources under its command, relying heavily upon a robust communication infrastructure. The FCO approach is similar to the maritime emergency approach in terms of the Control function in that the resources employed can be wide and variable and can be several thousand miles away and wholly outside of the FCO's direct command.

Communications during an emergency can be complex and has been studied extensively, in particular in the health profession (Slade *et al*. 2015), but little in the maritime sector in terms of an interactive discourse between ship and shore based emergency coordinators. In the maritime sector emergency communication references tend to be confined to procedures set out in international legislation and regulation (SOLAS, 1974, as amended). Although the Standard Marine Navigational Vocabulary (SMNV, IMO, 1985) gives general guidance on dealing with Distress, Safety and Urgency exchanges, the phrases used are basic. Masters and crews of ships in an emergency off a foreign shore are invariably left to their own devices and their varying grasp of English as the accepted language of the sea. It is

surprising that those responsible for the management of MME when a common language is lacking, seldom call for interpreters to ensure a clear understanding of the situation as it develops and struggle through on broken English often in difficult communication circumstances such as intermittent radio exchanges.

There are systems and, so called, plans used by health professionals, such as Crisis Emergency Risk Communication (CERC – Centers *[sic]* for Disease Control and Prevention) and also by nations, such as the USA Homeland Security Communications Plan (Chertoff, Homeland Security, 2008). In developing these approaches the authors cite repeated communication failures during major emergencies and, in my own experience, this is often the case with MME which can seriously disrupt the C4 framework. It would seem that basic principles are forgotten and simple understandable words are ignored.

There are many definitions of communication; the Oxford Dictionary defines communication as *"The imparting or exchanging of information by speaking, writing, or using some other medium".* In my view, this definition is not quite complete. For example, it is possible to speak using some other medium such as a radio, which in the maritime world creates its own issues. Similarly, it is possible to communicate in writing by passing the communication through, say, a FAX machine or a computer network by email. So, using the above definition, a clearer definition in my view could be:

"The imparting or exchanging of information, between one entity and another, using devices intended for communication as, and if, necessary by speaking, writing or other means".

This definition allows for a device to be used for the exchange of information. I clarify the definition further in Section 2.5. With the increased development of the mobile phone and its allowed use on airlines and in what used to be sensitive environments, for example, hospitals, emergency communication using what used to be seen as conventional means can be overshadowed. There have been examples of shipboard communications being out of action during an emergency and only a mobile phone being available for ship to shore communication. Indeed, during the Prestige incident (Chapter 4, Case Study #1) the Master was speaking from his stricken ship in the Bay of Biscay to his office in Greece using a mobile phone. Meanwhile the emergency operation was being conducted using other more conventional means, such as radio. As a consequence, an analysis of transcripts from the

formal communications media omitted those from the master's mobile phone resulting in an incomplete communications record of events; the same was true of those involved in shore-based activity that used mobile phones to exchange information. In short, there was no communication discipline and contemporaneous records were incomplete.

Much of what is written about communication, and the many consultants who advise on it, discuss the principles of communication and use of the devices for doing so. Communication discipline is implicit but not spelled out. In much the same way as the C4 framework is fundamentally sound it is the discipline required in its implementation that falls short. The National Communications Association (NCA) presents a transactional model of communication (NCA Website, 2015) that is simple and straightforward but again and ironically, does not discuss the importance of communication discipline. It also lists many forms of communication from applied communication to visual communication and many varieties in between. In an MME the individuals involved may speak different languages and understand maritime terms in different ways. Against this background the International Maritime Organisation (IMO) has introduced its Standard Marine Communications Phrases (SMCP, 2001). This manual replaced the former SMNV, as mentioned earlier. Sadly, I expect that the use of the SMCP will likely suffer the same fate as the SMNV and will be seldom used. Reference to such a manual during a dire emergency is uncommon even if the document could be referenced during an emergency on the bridge of a stricken ship. Moreover, the manual is only referred to briefly during the training of mariners and coastguards. Indeed, and possibly to my detriment, during my four decades of dealing with maritime emergencies I never referred to the SMCP or its predecessor once although I was aware of their existence. Experience suggests that I am not alone.

Communication can be further complicated by exchanges of information between two entities that have a common language simply because the terms involved are not understood or have different meanings. Bernard Shaw and Winston Churchill have both been attributed with a phrase concerning Americans and the English being divided by a common language and there is some anecdotal evidence to suggest this is the case. It is commonly thought that the British are the masters of understatement and this can sometimes lead a serious misunderstanding. In 1951, 650 soldiers of the Gloucestershire Regiment were surrounded by an entire Chinese division on the Imjin River in Korea. Their

commander, Brigadier Thomas Brodie, told the Americans that *"things are pretty sticky",* a statement that sounded reassuring to American ears but was as close to a scream for help as British understatement would allow. The British were left to fight on without reinforcement; just 40 survived (McIntyre, 2011).

A similar situation arose during the Prestige Incident (Chapter 4, Case Study #1) when the Greek master of the ship retained his composure throughout the incident regardless of the difficult and hazardous circumstances that prevailed. In addition to the language difficulties I believe his outward calmness was interpreted by the Spanish as a calm situation on board; this was far from the case. So it would seem that even when all the essential ingredients for an exchange of information are available problems can still occur, particularly in an MME when those who are in command of the incident are in a safe and somewhat serene environment and those in distress are in a distinctly different and hazardous situation.

The fourth component of the C4 framework, coordination, was added later to C3 in the context of civil emergencies (C4), such as Hurricane Katrina (Katrina website, 2015) in the USA in 2005 (Daniels, 2005). Coordination nevertheless has been the bedrock of emergency maritime services worldwide in one sense or another for very many years but has not appeared in literature as a defined component of any framework. My C4 framework therefore is not a common format. Coordination is generally seen as the environment in which the other components of C4 are captured. Therefore, whilst the individual components of C4 have stood alone or in combination, C4 as a framework used a construct for the purposes of this study is not a commonly recognised combination. There are several military papers that include co-ordination among its references to C2 and C3, but it tends to be considered as a by-product of C2 and C3 (Daniels, 2005) rather than a component in its own right. Nevertheless, Schwabel (2007), himself a military officer, cites coordination with the military as a principle area of criticism by many after action reports in the wake of the Katrina emergency (Daniels, 2005). Schwabel (2007) considers this to be unfair as over 18000 military personnel were involved in the emergency saving many lives. The criticism says that the unified command structure that should be dependable in such emergencies fell short. Although I have not seen any evidence to suggest this, I feel that military command structures work well within a military environment but with the many different interests in a

civil emergency together with the different levels of C2 and the diversity of resources it is perhaps inevitable that coordination, among other things, breaks down.

As discussed earlier, Coordination as a component of the C4 framework arises primarily in a maritime emergency context and is often seen as a self-evident function and not worthy of independent treatment or discussion, thus it does not often feature as a particular aspect of research. It is seen as an inevitable consequence of having a number of assets at the scene of an incident and their obvious distribution. For example, in a land-based emergency, police, fire and ambulance assets arrive and are marshalled to appropriate locations to fulfil their role; in some cases rendezvous points (RVPs) are predetermined for each emergency service. Once in place that, as they say, is that. The situation is of course different in a military context in that the assets are moving to complete their mission; this can still be achieved without the complexities of a moving environment, such as the sea. Moreover, the control of military resources is a given, where they are ordered to carry out tasks, and unlike those in a civil maritime context where 'commands' are more likely to be requests. Moreover, when conducting a search for missing lifeboats or people adrift at sea navigational errors of the resources themselves can provide an additional challenge as the command centre may have the resources plotted on a chart from locational advice they give but in reality they may in fact be, in some cases, a mile or so from this location; even sophisticate navigational equipment can be prone to error. The result is that the command may think that a given area of the scene has been searched when in fact it has not. I attempted to address this issue through the computerisation of search unit effort allocation – the allocation of assets to certain search areas that took into account the navigational errors of the assets and thus reduced the error of in designated search areas (Astbury, 1987). However, whilst the software worked the operators could not always understand the concept and tended not to use it; Several years later I discovered that it was brought about by the tutors' lack of understanding, thus the students were never given the opportunity to understand.

Given the differing degrees of understanding about C2 and its derivatives it is hardly surprising that coordination does not often find its way into any combination of C2 derivatives. Moreover, coordination tends to be captured within an understanding of control. Not a great deal of literature, therefore, exists about the practice of coordination in the maritime context save that which exists within the maritime Coastguard sector (UK CG

OMI). Coordination is about situational awareness and about an understanding of the Common Operational Picture (COP) as described above. A commander can understand a two-dimensional visual display showing the distribution of assets at the scene of an incident, but grasping the three-dimensional situation on the ground and air in a dynamic rapidly changing environment is not that simple and requires particular aptitudes[5]. The US Coast Guard train for situational awareness (Team Coordination Training Student Guide 8/98) and describe Situational Awareness as "the ability to identify, process, and comprehend the critical elements of information about what is happening with regards to the mission". Put more simply, it is being aware of what is going on around you.

In the civil maritime context of MME the best source of reference material on coordination resides within HM Coastguard's Operations Manual (2010). The manual is electronic (UKCG OMI) and I was allowed unconditional access. It suggests that in a maritime context there is a greater need for co-ordination of resources because the medium over which an emergency operates is literally and metaphorically 'fluid' (i.e. the sea), and many of the resources involved are not dedicated to the task of emergency response. For the most part additional resources, as they are called, are vessels at sea that happen to be in the vicinity of the emergency and the crews have little or no training or competencies in dealing with emergencies involving other vessels.

2.3 The C4 Operational Context

The context of the C4 framework within the management of MME is best described by considering MMEs within a hierarchy of 'Incidents'. It can be seen from Figure 2 that MMEs sit within a family of incident types which comprise major, moderate and minor emergencies. Within the major category of emergency incidents, in addition to maritime, there is aviation and land based emergences. Whilst some aspects of these emergency types in terms of their C4 framework have been researched and discussed, the focus of the study is maritime. Moreover, within the maritime context the focus is within the field of MME and the many incidents that this term involves. It does not consider aspects of the C4 framework within this context from the perspective of the vessel involved only the C4 framework as

[5] Spatial awareness aptitude is assessed, for example, among potential Apache Attack helicopter pilots where it is necessary to fly the aircraft using one eye and fire weapons using the other.

implemented by shore-based organisations within state authorities set up for this purpose. However, it has been necessary to include the source vessel within the activity map (Chapter 3) as a point of origin for the C4 framework.

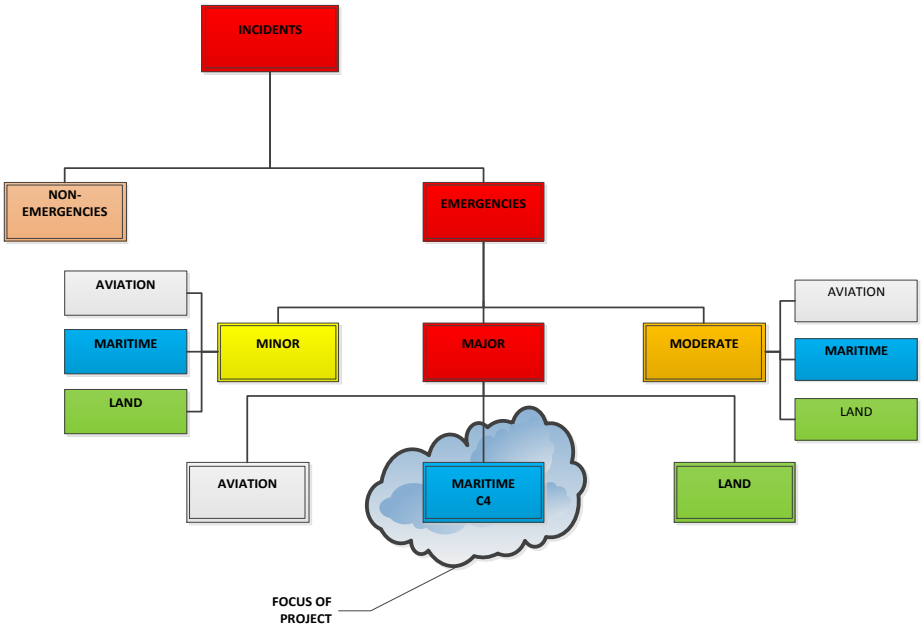


Figure 2 - Context of Maritime Emergencies (source author)

The components of MMEC4, described in this thesis, form a 'framework for action' in dealing with a major maritime emergency[6]. The C4 framework will be dictated by the context in which it is adopted; in the case of this study the context is maritime. Whilst the basic framework may be similar in the aviation and land-based emergency contexts there will be subtle differences. Although I have described C4 as a framework, in reality the lines between its components can be somewhat abstract in that they are not clearly identified phases or stages of incident by those in command but rather a way of describing the links between components for dealing with an incident. The relationship between each C4 framework component is shown in Figure 3. In this conceptualisation, communications is shown as a separate linking component bringing together the other three C4 components and is also

[6]The study does not cover C4 for all types of civil or military emergencies as this is outside the scope of my experience. However, it is expected that the outcomes from this project may have implications for C4 in general emergency management.

shown as an internal feature of each. Communications is, therefore, an internal and external function of each of the Command, Control, and Co-ordination components.

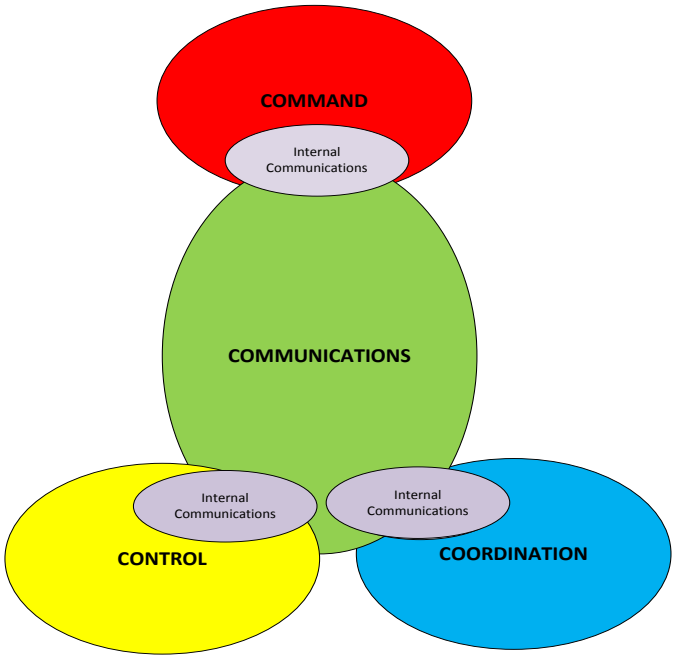


Figure 3 - Interrelationship of C4 components (source author)

Of course, the C4 framework cannot be considered only in this simple diagrammatic manner, as it is more complex and contains various levels and degrees of interaction during an emergency. For example, the relationship between the C4 components can be shown as set out in Figure 4. Here there are three levels of command: the overall commander with responsibility for the successful outcome of the emergency, and two on-scene commanders (OSCs), one with the responsibility for all the dedicated SAR resources such as SAR helicopters and rescue boats, and the other for additional resources such as passing ships, and fishing vessels. It may be that an OSC is required for these resources as they may communicate in a foreign language to that used by the more local dedicated resources or it may simply be for communication convenience to separate overall communication traffic (the communications discipline among dedicated resources is somewhat different than that used among some commercial vessels). Each of the resources, both dedicated and

additional, will have an operating authority and it may be that they retain contact with these bodies during an incident; it is also possible that they may be recalled for a variety of reasons, e.g. military helicopters may be assigned what are considered more urgent tasks or a passing ship may have to continue on its voyage to make the tide at its destination port or may be short of fuel. The overall command may act as the controlling authority for some of the dedicated resources (shown by a connecting arrow).The communications structure should be noted as the resources under each OSC will operate on different communication media whilst the OSCs themselves will have a joint communications medium to discuss resource use or search patterns, for example. Each OSC will have a dedicated link to the overall commander and the OSCs will have a dedicated link to its resources for coordination.

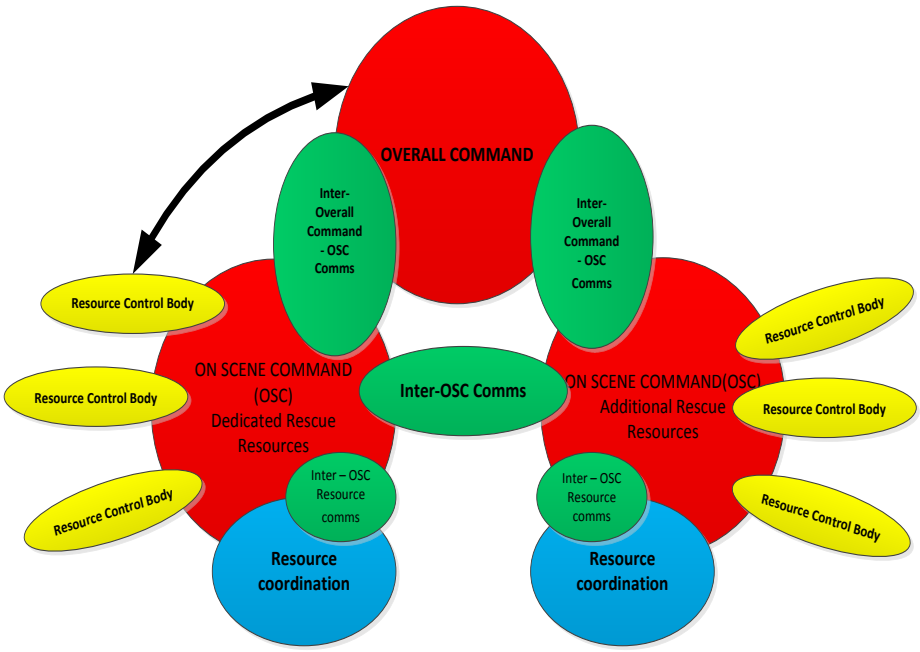


Figure 4 - Example of C4 Framework Arrangements in Operation (source author)

The basis of the C4 framework originates, as previously discussed, from military C2 doctrine. The most definitive work on C2 in the military context is the report by Alberts and Hayes (2006) which covers a great deal of ground on understanding command and control.

Although communication and co-ordination are not explicitly covered, mission effectiveness, situation information and information quality are included within the Command and Control Conceptual Model (Alberts and Hayes, 2006). Alberts and Hayes (2006) intention was to rethink the subject of Command and Control and indeed, in the military and scientific context, this is achieved. However, in the military environment situations can be formalised and have more rigid and linear command hierarchy and closer control can be exhibited than in a more diverse and fluid civil arena such as that found in an MME C4 framework situation where control by resource owners can be exhibited at several levels and across several components and is a matrix rather than linear hierarchal structure. Moreover, the commanders can be at various experience and competency levels within many different organisational structures. For example, the skipper of a fishing boat acting as on scene commander (OSC) of a group of fishing boats at the scene of an emergency will find him or herself at the same command level as the captain of a warship or coxswain of a SAR rescue boat.

Alberts and Hayes (2006) suggest that "*Command and Control individually and collectively mean different things to different communities"(*Shaw 1980, Conley 1979). In my experience I have found this to be true, as discussed earlier, and I would go further and say that it means different things to people and communities (Shaw, 1980). Indeed I have come across people whose understanding of command and control is almost non-existent and they bandy the words around simply to imply that an incident is somehow being 'taken charge of' or to demonstrate that they know what they are talking about. A lack of understanding of command and control crosses all ranks and is not confined to those in the lower echelons of an organisational structure. I refer below to the handling of the MT *Prestige* incident (Chapter 4, Case Study #1) where there was a failure in the implementation of the C4 framework across all areas, particularly in command. When I refer to an understanding of C2 in this study I am referring to an ability to express definitions with clarity and to understand what they mean and how they are applied, I am not implying that everyone will have the exact same definition of the C4 components but suggesting that an understanding of the components should be close enough to enable a successful incident outcome. It may even be the case that an individual's understanding of C2 gets modified as an incident progresses. I once asked a Coastguard commander to explain the difference between Command and Control. He told me they were inseparable, like salt and pepper and you could not have one

without the other. I suggested that commanding something or someone was different from controlling them but he disagreed. I then asked why there were two different words and not one to cover the tasks and he said he would go away and think about it; an example of Albert & Hayes (2006) views on C2 as expanded by my own views.

Alberts & Hayes (2006) clearly make the point that command and control are obviously different functions albeit closely linked but that such definitions as there are in the military context are more associated with the legal distribution of authority; giving status to those in charge within a command structure. This may be true in a military context but not so in the more fluid and 4-dimensional matrix approach adopted in an MME. Following their work with senior professionals from NATO and others they go on to define three key factors that define C2. These are: allocation of decision rights; patterns of interaction among those involved (actors); distribution of information. They show the C2 Approach Space diagrammatically as a 4-dimensional model with each of the factors along each dimensional plane. I have reproduced their diagram below, Figure 5, for the sake of clarity and for my own use in this study.

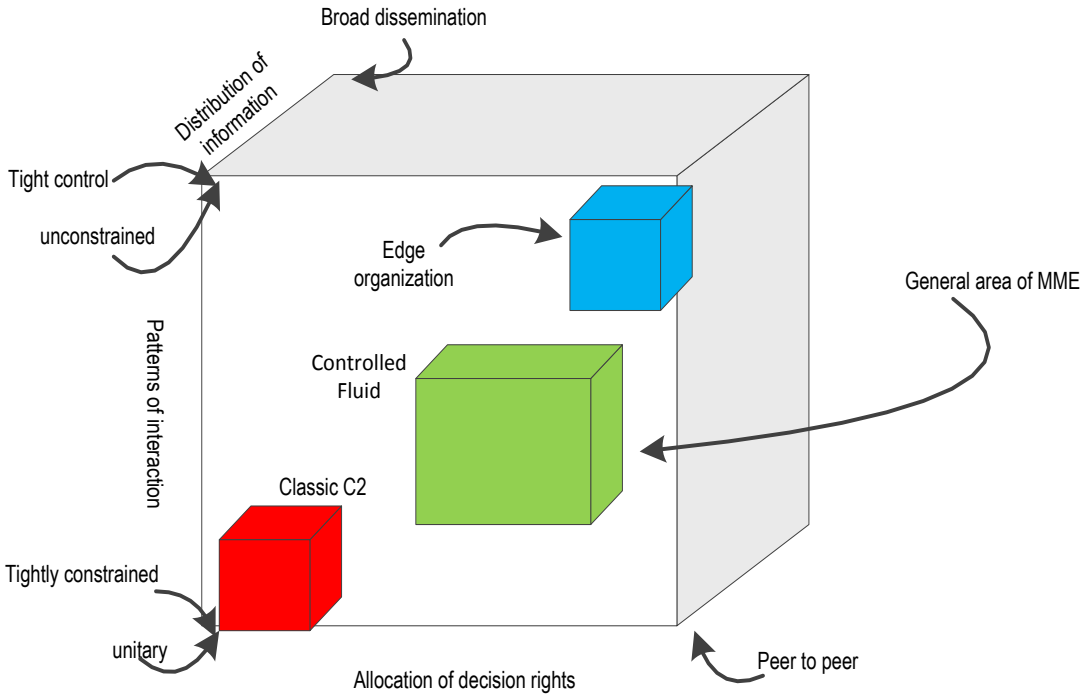


Figure 5 - C2 Approach Space (after Albert & Hayes, 2006)

Figure 5 shows whbert & Hayes (2006) consider to be the 'classic C2' arrangement with a unitary decision rights, tightly constrained patterns of interaction and tight control of the dissemination of information. An 'Edge Organisation' is considered at the opposite end of the matrix with peer- to- peer allocation of decision rights and unconstrained patterns of interaction and broad dissemination of information. The most common position on the matrix for MME from my experience is somewhere between the two pole positions but closer to the Edge Organization. I have called this the Controlled Fluid position. The Alberts & Hayes (2006) diagram is useful for showing the varying approaches to C2 and can also be applied to any combination of C4 components and is not limited to C2. For example, an MME using only dedicated resources could be considered to have its coordination component toward the classic position whereas an incident using a wide variety of different resources with different languages and commands could be closer to the edge situation. I raised the issue of resources in (Chapter 4, Case Study # 5) and considered the need for command ownership and control. Similarly the communications component of the latter situation could also be closer to the edge and the former closer to the classic position. My diagrams of C4 (Figures 3 & 4) fit well with the structure of Figure 5. The 'edge organization' is wholly agile where the classic position is largely inflexible and purely militaristic. The situation during the MT Prestige incident (Chapter 4, Case study #1) could be said to be even beyond a classic situation and somewhere within the controlled fluid area. Case Studies #2 and #3 (Chapter 4) are also within the controlled fluid arena toward the edge. This is where the majority of MMEs can be found.

Interestingly, in their final thoughts Alberts & Hayes (2006) say that C2 has the reputation of being *"an arcane subject and as such it is unfortunate given the central role that C2 needs to play in our transformation to effects-based Network Centric Operations…".*They go on to say that C2 is *"everyone's concern… and interest and concern about Command and Control should no longer be left to the C2 specialist".* I would agree with this contention and would suggest that more basic awareness of C2 and the distinction of other components of the C4 framework is what is needed among all those who set out to practice them.

2.4 Refining the C4 Component Definitions

Drawing upon the above discussions of each of the components of the C4 framework I now pose my own definitions for this study.

Command: The word Command is in common use across many activities and can mean a range of things to many people. It can for example, convey a dictatorial approach to management or leadership. On the other hand it can simply mean that someone is 'in' command and not convey any attitudinal interpretation. The range of interpretations in the context of the management of managing MMEs can cause confusion and can lead to command failures – this is explored later in this paper. But suffice to say at this point that misunderstanding the meaning of command among those engaged in an MME has led to many failures.

In the context of managing MME I have determined a generally accepted definition of command that has been (and still is) used within the maritime emergency field. I consider command to be:

> *"Taking responsibility for the assimilation of information about the emergency and for decisions about the actions to be taken to resolve the situation."*

The command of a maritime emergency is usually taken from an operations centre remote from the scene of the incident but with appropriate communications media to facilitate an understanding of action at the scene. However, in some cases aspects of command can be delegated to appropriate persons near or at the scene, such as the organisation of local search and rescue (SAR). This local arrangement is called the On Scene Commander (OSC) procedure. If for example an operation is taking place in a location where English is not common across all units (normally non-dedicated international SAR units such as passing vessels, fishing vessels and so on) the commander may consider it prudent in the context of good communication to assign a local OSC who can communicate with a group of units in their common language. Overall Command of the operation will remain with a single entity and usually a sole individual (Figure 4).

From the behaviour I have seen exhibited, the effectiveness of command within the C4 framework has been shown to rely to a large extent on the quality of the commander and

his/her ability to sort through a great deal of information in a short space of time then act upon it, making decisions, with sound judgement. The selection of those in command is therefore of paramount importance to the success or otherwise of the emergency. *S*plit or repeated changes in Commander can cause continuity problems in managing MMEs and court failure.

Control: *The ability to assign resources to the actions decided upon. In maritime emergencies the resources available to deal with an emergency do not for the most part come under the jurisdiction of the incident command.* Thus the command must request the participation of such resources for the emergency. The 'controlling' agency is therefore the body that approves the resource participation and retains 'control' of that resource until it is committed to the emergency. Once committed it comes under the jurisdiction of the command. Examples of authorities that have 'control; over their resources in the maritime field are the Royal National Lifeboat Institution (RNLI) and the Ministry of Defence for military purposes. Control is also the application of authority, combined with the capability to manage resources, in order to achieve defined objectives. Some organisations define command and control together, but the key element of control is the combination of authority with the means to ensure command intent is communicated and results monitored. While absolute command cannot be exercised by one organisation over another, authority to exercise control of an organisation's personnel or assets, for a specified time period to attain defined objectives, can be granted or delegated to another organisation. This granting of control does not imply that the responsibility for those resources that have been transferred.

Confusion can arise when the resources belonging to an organisation such as a lifeboat rescue authority are committed to an incident and come under the control of the command for that incident but the owners of the resources still insist on retaining communications with them and an element of control. Ownership of resources is therefore a significant factor in resource management.

Communication: *The media (technology and language) through which the other components of the C4 framework are carried out and that provides information about the emergency and conveys decisions from the command and the results of actions taken back to the command.* See also my earlier clarification of the Oxford Dictionary definition (Section

2.2). Appropriate (e.g. radio) and consistent (guaranteed continuity) communications are vital to managing a maritime emergency (or indeed any emergency) as is a common form of language. Emergencies at sea require a complex mix of communication and can be driven by the communication available on the casualty[7]. For example in a shipping incident the ship may have complete power failure and the only communication media available to speak to rescue resources is a mobile telephone or handheld short-range radios. In other circumstances the whole range of maritime communication may be available, including satellite and terrestrial radio. In Figures 3 and 4 Communication is shown as the hub of the C4 framework as it links all components. The media by which communication takes place is only one aspect of good communication. It is vital that the language of communication is appropriate to the situation. This includes a common language to exchange information and a clear understanding of the terms involved. The IMO has published a Standard Marine Communications Phrases booklet (IMO SMCP 2002 – Resolution A.918 (22)) to enable a common understanding of phrases in English. The SMCP replaces the former Standard Marine Vocabulary (SMV) also in English and aims to improve communications exchanges in normal operations and in emergencies. However, my experience is that the SMV was seldom used in emergency situations and it is likely that its successor will have the same fate however well intentioned. Emergencies at sea call for prompt action and immediate understandable communication both in technology and language and regrettably sifting through a booklet seeking out a common understanding is unlikely to meet the requirement. The best option, in my view is a competent translator. During my time as the UK Coastguard Chief Operations Officer I introduced a translator system that enabled commanders to call upon such services on a 24/365 basis. It may have been useful during the Sea Empress incident off Milford Haven in February 1996 when the commander was criticised in the media for his use of a Cantonese waiter from a local restaurant in Falmouth to assist in translation with a Chinese salvage tug. Indeed he was ridiculed for this attempt at 'communicating'. I suggest that this attempt, however strange it may have seemed, was a sensible endeavour in the circumstances. The alternative of struggling to make sense of Cantonese in an emergency would have perhaps been more problematic.

[7]Casualty is a definition applied to a person or ship/boat in need of assistance.

I have witnessed incidents where a watch officer spoke to a boat owner in distress on VHF radio in very formal terms asking for his position in latitude and longitude. The sailor didn't understand a word but would have been able to tell the officer that he was about a mile off a prominent lighthouse. Clearly communication is not restricted to the use of communications technology, communication is about a common language between those exchanging information. The physical act of communicating through technology is becoming more straightforward, it is the act of understanding that is becoming more difficult.

Co-ordination: *Placing resources in the right place at the right time to discharge actions to resolve the emergency.* The co-ordination component of C4 is mostly a feature of maritime emergencies and does not tend to feature within a terrestrial or non-maritime emergency. This is because the maritime response to an emergency involves a potentially wide range of resources that may or may not be dedicated to, or declared for, search and rescue (SAR)[8]. A SAR incident may involve the response to a missing windsurfer or a swimmer a one end of the scale to a major maritime disaster involving hundreds of people. The communication complexity of handling resources at the scene of a large scale incident may require the establishment of an On Scene Commander (OSC) to co-ordinate the resources to best effect. This can be a declared SAR aircraft flying over the scene or a designated boat that is able to communicate to all SAR resources locally. In some extremely complex incidents where communication may be problematic, for example language problems, more than one OSC may be assigned to deal with clusters of resources using different communications media or speaking different languages. The OSC(s) is (are) designated by the Command and is/are subordinate to it. It/they provide the information from the scene to the Command through designated communication media.

For example, an incident off the Scottish coast for missing fishermen involved Scottish, Spanish, Welsh and English fishing boats required 6 OSCs; one for each cluster of fishing boats, one for aviation resources and another for the RNLI lifeboats.

[8] Declared resources are those specifically dedicated to SAR; other resources that may from time to time be available for SAR, for example ships in the vicinity of the emergency, and are called Additional Facilities.

Chapter 3

Activity Mapping

3.1 C4 Framework – Links and Components

The previous two chapters described the basis for this study and defined the C4 framework components within the context of an MME. This Chapter describes the C4 framework structure, its dependencies, interrelationships and the environment in which it operates as a vehicle to understanding the evaluation of case studies in Chapter 4. It also considers the professional practitioner survey in Chapter 5 and appraisal of cognitive decision making, studies in the MME context, and the psychology of thinking approaches in other emergency sectors.

The Activity Map at Figure 6 sets out the links and associated tasks or activities between components of the C4 framework that I have devised from my professional practice, which is summarised in my PWI (Annex A).There are six overarching categories encapsulating the C4 framework, also derived from my public works and professional practice. These are shown in the Activity Map and identified as: Process; People; Resources; Organisation and, Political and Cultural influence. Organisation is considered in so far as the other categories impact upon it and it in turn impacts upon them; clearly there are many wider national and international matters of organisational policy that are out with this study and these are covered to some extent by the influence of politics and culture.

What follows is a description of the six overarching categories that comprise the C4 framework. The framework set out in the activity map is considered an exemplar against which my public works and professional practice is evaluated and later my analysis of this evaluation together with the results of my survey is used to develop Favourable (F) and Unfavourable (U) practices and subsequently positive principles for action.

It is important at this point that I explain the methodology I used to construct the activity map. Activity mapping is usually associated with corporate business strategy (Anderson *et al,* 2006) but I have used this term as simply meaning 'activity', that is, the activities or tasks that together form the elements of the C4 Framework components. However, in the business activity sense the C4 Framework could be said to deliver customer benefits and a value statement could be derived although generally speaking the framework is not in a competitive environment. I could usefully call the map a process map but did not wish to confuse the C4 framework with the process aspect within the map.

My starting point for the activity map was to identify the C4 processes I have experienced and used in my professional practice and to develop them into a set of linked actions that would result in a successful outcome. Alongside the operational processes I identified, again from my professional practice, the way in which people are recruited, selected and trained to carry out the processes. It was relatively simple task to identify the elements of the organisation in which the people and processes operate. The resources were identified as a development of the operational process. Once each component of the C4 Framework was identified I linked them to form a cohesive structure which I consider is overarched by ever present political influence. The map is clearly based therefore on my professional practice and might be different if drawn by someone else; although I suspect it would not be too different as the elements involved are well known among the maritime emergency community. That said, the culture that resides in the member state that hosts the competent authority will play a part in forming the activity map and indeed the way in which elements fit together and relate; I have given some examples of this in my PWI case studies later in this study.

3.2 People

Essential, indeed I would suggest critical, to the MME system process are the people involved and events leading to them being involved in the emergency. Key to this in my view is the recruitment and selection process for new recruits who then go on to be trained in various aspects of emergency management and ultimately may become commanders of MMEs. Rozinskiy (2014) discusses his selection of teams and makes the point that "*your team will make you succeed or fail".* One of the considerations Rozinskiy (2014) lists is behaviour rather than skills. This is an aspect in recruitment for those working in the maritime emergency sector from my experience that is often overlooked and it is the potential skills the individual brings to the organisation that are considered rather than their behaviours. I have witnessed subordinates and senior officers who have a doubtless abundance of skills but their behaviours were appalling in terms of attitudes to other people and the emergencies they handled. Their skills have been diminished by their lack of appropriate behaviours resulting in subordinates and seniors alike disregarding any advice, however potentially valuable it may be. I am not suggesting that skills for the job should

not be considered, but that behaviours of people in exhibiting those skills can prove to be a greater factor in the success or otherwise of an emergency situation.

The People elements of the C4 framework are set out in Figure 6 as experienced during my professional practice. The activity map within which these elements reside is an exemplar only and is not absolute. Recruits are invariably taken from those with emergency service, military or civil maritime backgrounds. Recruitment is based upon competency profiles and interviews (Stainburn, 2014). Competency profiles generally comprise the knowledge, skills and attributes required or a particular job being carried out in a particular environment. In the case of MME and the C4 framework the competency profile should consider what is required within a maritime, sometime quiet environment but escalating swiftly to a very high pressure environment where decisions may need to be taken within minutes. In my experience once competency profiles for a particular job are published potential candidates quickly become familiar with what is required to complete the application form and can revise the competencies before any interview. This may appear a cynical view but having been on very many interview panels (but not on the interview selection board) I have come across far too any candidates that, on paper, appear highly suitable but upon closer examination are far from suitable. See my later critique on the Spanish Director of Merchant Marine, the commander of the Prestige incident (Chapter 4, Case Study #1). I would question the value of competency profiles if they are not developed with the inclusion and advice of operational personnel. Moreover, I would test candidates in a simulated operational environment, in particular to witness their behaviours under pressure. Bore *et al*. (2009) suggest a selection regime for the selection of medical students grounded in cognitive and personality selection theory and practice. They argue that no comprehensive medical student selection process exists and that institutions use a variety of methods. I would argue that medical staff can find themselves in similar situations to maritime emergency operators, moving from idle to full speed in short time under substantial personal pressure. I would not argue for sophisticated cognitive and psychological tests for maritime operators but I would suggest that the current regime for selection can be improved and that simulation can play a part; I mention later the introduction of simulation into the medical world to avoid the equivalent of aviation's cross-cockpit gradient (Last, 1999).

The current process for the selection of maritime emergency operators, for example, UK Coastguards, involves competency profiles, interviews and reference take up. Once these steps are completed the successful candidates are sent to a command centre to prepare for their new entrant or initial training. The schedule of such courses dictates how long the new recruit has to wait on station before they embark upon the training course. Recruits will of course get some supervised on job training at their centre; they are not selected on the basis of which particular aspect of C4 implementation they are most suited to but on the basis of their overarching maritime skills or associated skills and experience (for example, a former army member or civilian can be recruited on the basis of their attributes in command and/or communications) but all, regardless of their background start at the same trainee point. It should be noted that not all recruits find themselves in command positions and this is true for all emergency services. Not going forward to gain a command position may be a personal choice or that the individual is not selected as being suitable. Suitability is an issue that I explore further in this study.

Following a period of training in a range of subjects – SAR procedures, search planning, and communications and so on – recruits are assessed through a series of examinations and practical tests. If they pass the assessments they are deemed suitable to take on the role as a bona fide command centre operator. If they fail the assessments and depending upon the severity of the failure recruits may be given another opportunity to re-sit the assessment. If they fail at this attempt their services are dispensed with. Thereafter, command centre operators can go through a series of promotions, some of which require further assessment, and may move to other command centres around their country; some remain in situ for many years. In some cases, promotions involved being in command of operational areas and thus being in overall command of MMEs in those areas. In case of national or international interest the command may pass to a national commander.

In some cases recruitment takes place under what is called a direct entry scheme. This is akin to what many organisations call fast track. Under these circumstances recruits can be taken from senior positions in the civil maritime or aviation spheres and after initial training put in middle management or less frequently in senior operational positions. The recruitment process is similar to that for basic grade new recruits but management experience and leadership in an emergency context are competencies that are focused on as prerequisites.

For the most part new recruits to command centres spend considerable amounts of time as communication operators and in support of general SAR duties. Experience and competence in these roles can be taken as suitability for promotion. An assessment for command suitability is usually restricted to a command course with limited exposure to simulated emergencies during which they take charge. The root behaviours of individuals and their suitability for command are not assessed. The rule is usually: if you can do your present job well you are suitable for the job at the next higher grade job. My experience suggests that: if you can do your present job well- you *may* be suitable for the next higher grade job; it is not a given.

The recruitment and selection for command personnel does not necessarily, from my experience, include any management or leadership assessment prior to them being contracted. Moreover, specific qualities for command are not assessed before personnel are taken on for such positions – other than perhaps in a limited way through skill-based courses – as an individual progresses through the organisation. People can also be promoted on the basis of how well they are doing their present job, which may or may not host features of command. It is quite possible for an individual who has performed well in an administrative capacity to be promoted into an operational command position and find themselves ill-equipped to command an MME. The 'doing well in your present role equips you for the higher and wider level' is not a fundamentally sound approach.

The follow-up to MMEs or indeed emergencies in general involves lessons learned but I have often heard it said, and I agree, that incidents generate a lot of lessons learned but no one seems to learn any lessons. The lessons learned tend to be focussed on the C4 framework processes and organisation rather than people – unless there has been a high degree of negligence or the outcome of the MME courts a high level of public and/or political interest through significant failure in handling the emergency. De-brief documents are produced and invariably gather dust unless there is a major inquiry and political interest. For example, the pleasure boat Marchioness collided with the dredger Bowbelle in 1989 on the River Thames (MAIB Report, 1991) with the loss of 51 lives resulting in 27 recommendations. A subsequent inquiry led by Lord Justice Clarke (1990) resulted in more than 140 additional recommendations for government. I gave evidence to this inquiry and was involved in the implementation of some of the recommendations, particularly those involving the

establishment of a coastguard and lifeboat service on the River Thames. I met with the Marchioness action groups and felt the force of opinion from survivors and next of kin about the importance of the recommendations and timely implementation. However, in general terms the lessons learned and any recommendations from little-known emergencies tend to be left on the shelf.

3.3 Process

The dynamic of the C4 framework is a relationship between many activities and related tasks emanating from simple decision trees. Beer (1975) considers decision trees to be artefacts and useless as the complete decision process involves many people and thus suggestions leading to sub-decisions and a great deal of complexity. He offers that anyone involved in a decision making process would know this. Whilst I agree to some extent with Beer in that the decision process can be complex and involve much feedback from many people, it is precisely because of this that the process needs to be kept simple and remain in the hands of a single commander. Fragmented command can make the situation even more complex (more of this later). During the life of the emergency it is essential for the commander to hold regular briefing sessions or 'time outs' with command centre personnel, say every two hours or so, to ensure that he or she is up to date with developments and that all involved in the command centre are also kept abreast of developments. An individual who may take a radio or telephone message in the heat of the emergency may fail to record it or advise the commander; regular briefing sessions allow the opportunity for such information to be expressed and captured. It is also the case that in many emergencies with which I have been involved where regular briefings have not taken place a final debrief on conclusion of the emergency reveals several versions of events, comprising some information that, had it been known at the time a key decision was being taken, could have changed the overall outcome. Keeping personal logs throughout an emergency can also assist the commander and others to recall specific events and the rationale for actions. I have used the internal telephone system for such personal logs as the command centres in which I have worked recorded all communications; lifting a telephone receiver as though to make a call activates the recording device so it can be used like a personal memo recorder. The information then appears on the subsequent transcript for that telephone line, is digitally timed, and available for any legal proceedings or internal disputes.

The C4 framework implementation starts with the alert received at the shore base from a ship with the emergency situation on board. The receipted information is evaluated by the shore base commander. At this point a decision is usually made about the quality and quantity of the information received and further information is sought from the ship if time allows (in some circumstances communication with the ship may be lost for a variety of reasons, for example, if the ship sinks). Once the commander is satisfied that as much information has been received as possible he will consider available options for action – the commander may consult with others about such actions. Once decided upon the action is taken and monitored to assess the outcome. The commander may decide that adjustments to the chosen action or indeed different actions may be needed as the situation develops.

Throughout the decision process good and frequent communications with the stricken ship (if possible) and all others involved, including those within the command centre is essential. Often language or technical difficulties arise that make communication difficult. In the case of the former commanders should have available to them some type of translator service (although this is often not the case). Communicating with the ship if the vessel is still afloat but has lost communications power can be achieved by placing a communications officer on board the vessel if life is not directly at risk. The process is simple and, if adhered will allow a commander to ensure that appropriate actions are taken to ensure success of the MME. At the outset of the emergency the role of the person receiving the alert cannot be understated as they may be the only person to talk to those on board before all communications are lost. This role is therefore pivotal in initiating the MME system process.

As mentioned earlier keeping everyone involved in the emergency up to date with actions and developments is important to avoid repeated requests for information from interested parties (media, politicians etc.). It must be made clear as soon as possible into the emergency what the communication policy is for those with an interest in the outcome (e.g. government minister briefings). Communication between the command centre and the scene of the emergency, operational communications must be kept separate from those with an administrative or other concern, such as the ship owner (who may be in another country), press, politicians, and so on; communications schedules and briefing material must be established for this group of interests.

At the scene it may be necessary to establish an on scene commanders (OSC) to take charge of various resource groups – particularly if there is no common communication link or language between all resources (see Figure 4 complexity). The commander should set up one or more OSCs to ensure good communication between such potentially diverse groups to ensure a common communication thread back to the command centre.

Within the command decision process timely action may be vital and decisions about the course of action may need to be taken on the basis of very scant information; this can be an inevitable consequence of maritime emergencies. On the other hand there are occasions when time is available to obtain a great deal of information about the emergency and to consult with others about the course of action. It is essential within the MME system therefore that decisions about appropriate actions are tailored to the time available and not unnecessarily hastened simply for the sake of being seen *to be making a decision and taking action.*

Another important feature of the MME system process is the availability of resources to complete whatever action is taken. Up to date information within the command centre about available rescue or other response resources is essential. This reduces pressure on the decision process when the commander understands what is available to him when considering options for action. If can be the case when dealing with an MME that resources outside of the commander's usual control are considered. The decision to commit such external resources is invariably also outside of the commander's realm. I believe that a commander must consider the use of external resources as soon as possible into the emergency to avoid undue delay later. It is often the case that internal and external resources are placed on standby to avoid a cold start when they are needed.

The control of most resources involved in an MME whether internal to the country's command structure or external from another country will mostly rest with the organisation from where the resources come. For example, lifeboats that originate from a rescue charity or aircraft from a military base may still retain communication with their respective command centres. Whilst the coordination of all resources in an emergency rests with the commander, control of most resources stays with their own command. This can cause some difficulties when a resource base is communicating directly with a SAR unit on scene to the detriment of the command. The commander must therefore make it clear at the outset of

the emergency what his policy is with regard to resource control and communication to avoid any confusion or unnecessary debate during the emergency. I have witnessed resources being recalled by their command base without my knowledge resulting in a decision about actions being rendered void.

3.4 Resources

No emergency response organisation can function without resources to carry out its commands. Resources in the context of this study do not include people (people are treated separately) but utilities such as aircraft, lifeboats and other emergency response vessels. The source of resources can impact upon all C4 Framework components. In a military C4 framework (notwithstanding the interpretation of each component – C2 plus variants of C3 and C4) all the resources are invariably owned and under military command and thus under direct military control. In the civil maritime context this is not the case and resources are owned and operated by potentially many different organisations that only come together in the event of an MME. For example, an IMO or EU member state search and rescue region (SRR) might host dedicated SAR resources owned by both military and civil organisations that can be supplemented by vessels of opportunity at sea on an ad hoc basis which are not SAR dedicated and may not at any previous time been involved in an emergency response or SAR activity. The quality therefore of the resources available to a civil commander can range from dedicated and experienced to ad hoc and inexperienced. The latter can be super tankers or small fishing boats and yachts. Due to the complexity that can arise in implementing the C4 framework during operations, particularly with control and communications, maritime states should wherever possible establish their own resources (*cf* Chapter 4, Case Study #5).

If dedicated resources cannot be established the rules of engagement should be changed to ensure that once a maritime emergency occurs all resources commandeered by the maritime state commander come under the direct control of the commander. At present the commander only has the ability to coordinate all resources engaged in an emergency but can only control those that are dedicated and under state ownership. This can only be done internationally through the IMO and in Europe through the EU Commission via recommendations from EMSA. Whilst this would be the ideal approach at the very least maritime states should independently reach formal agreements with resource owners to ensure that control resides with the MME (and minor incident) commander during the

conduct of the emergency. In the UK agreements are in issue with dedicated resources such as lifeboats and helicopters, where these are not owned by the State, for the coordination of resources but control still remains with the resource owner, and this is unlikely to change in the near future without a national or international appetite for change.

3.5 Organisation

The vast majority of countries in the world, particularly those with a maritime interest belong to various international regulatory, governing or advisory bodies. By far the largest of these is the International Maritime Organisation (IMO) which hosts 170 member states and 3 associate members (IMO Web site).The IMO host an Assembly once a year but its main focus of work is its Maritime Safety Committee (MSC) that meets twice a year and around which are a series of annual sub-committees. Those of particular interest to this study are the sub-committees on Human Element, Training and Watch keeping (HTW), Pollution Prevention and Response (PPR), and Safety of Navigation, Communications and Search and Rescue (NCSR). Under these sub-committees can be many other groups, mostly working or drafting groups that carry out new work or revisions of, for example, existing publications and policies. These activities take place during the meeting period of the sub-committee but can meet outside of the sub group depending upon the work and timetable. As a UK representative at what used to be the Sub-Committee on Communications and SAR (COMSAR – until 2010 - now the NCSR), I led the UK at a working/drafting group merging the International Civil Aviation Organisation (ICAO) SAR Manual with that of IMO (IMSAR). The work took me to Halifax, Canada the home of the ICAO and to London (home of IMO) for alternate drafting meetings. What started out as straightforward task of merging the two manuals and overcoming some simple matters of procedure became a task that lasted several years ultimately resulting in the joint International Maritime and Aeronautical SAR Manual (IAMSAR) – even the name proved difficult.

The management of an MME and the implementation of the C4 framework can rely upon the extent to which a maritime state adopts the regulations and principles set out by the IMO in this context. It is the IMO that lays the foundation for the way in which its member states respond to maritime emergencies, although states have a large degree of flexibility in how they enact the IMO guidance. IMO sets out the top level strategy and member states

determine subordinate guidance and its competent maritime authority sets out working practices.

Whilst the IMO can be rather unwieldy and take considerable time in reaching decisions, the decisions it does reach invariably stand the test of time. It is interesting to note that the majority of the permanent representatives to the IMO are political appointments and not too many are what I would call maritime professionals. This has advantages and disadvantages. On the one hand, whatever is agreed at the IMO stands a better chance of political acceptance if drawn up by political appointees but on the other, some over enthusiastic political input can distort the policies. On balance the mix is about right with maritime professionals helping keep political excesses to a reasonable minimum. That said, it has to be remembered that with 170 member states (at 2015) and a multitude of languages the words used in policy documents are simple in nature with every attempt made to avoid ambiguity. On some occasions during my attendance at the IMO I could be forgiven for wondering if sub-committees would agree on the day of the week.

Once policies are ratified member states then interpret them into national legislation (or at least most do) with work instructions and relevant documents following on. New policies can originate from a variety of sources. For the purposes of this study I will consider lessons learned. I have already mentioned my view on lessons learned and the high level focus that arises from high level emergencies that attract political and media interest. As well as resulting in many national changes to the 'rules' they can result in international attention. For example, the Stockholm Agreement 1997 (Vassalos & Papanikolaou, 2001) dealt with the free surface water effect on ro-ro ferries. This agreement followed accidents on ro-ro ferries that resulted in capsize as a result of free surface water washing across car decks without any physical barrier to prevent such movement. Following the introduction of the Stockholm Agreement nearly 80 % of ro-ro ferries in North West Europe were subject to calculations to modify deck design to meet the new requirements of Stockholm. This is a clear example of a lessons learned that introduced wide-spread changes in ship design. The most notable accident that caused concern about ro-ro design that the Stockholm Agreement may have prevented (Robin, 1995) was the Herald of Free Enterprise which capsized off Zeebrugge in 1987 killing 197 passengers and crew following the ingress of water from the bow doors across the lower car deck.

The European Commission is another source of legislation and policy generation through its system of EU Directives. The Commission acts independently of the IMO but in addition to generating its own regulations can take an IMO policy and develop it into a Directive; in doing so the Commission can seek advice from another European body – the European Maritime Safety Agency (EMSA). Certainly many of the maritime EU Directives are well intended to improve maritime safety around the coasts and waterways of Europe but their implementation can be somewhat fraught. Take for example EC Directive 93/75 introduced in 1993 concerning the passage of dangerous goods around Europe. The UK was first to implement the Directive. As the person responsible for its implementation in the UK I decided to interpret the Directive in what I thought was a sensible manner; the Directive called for all shipowners and operators transporting dangerous goods to lodge their ship manifestos with the member state's competent authority. In the UK this was the Coastguard at Dover. In my wisdom, having seen the size and daily number of such manifestos (some over 300 pages long) that would have to be transmitted by FAX (the present day internet processes where not yet up and running) I decided that the ship owners/operators would keep the manifestos in their offices but notify the 24/7 contact to gain access to the manifest in case of emergency. Before too long I was advised by the Commission through the UK Shipping Policy Division that the UK was in default of the Directive and that if we did not apply the *letter* of the Directive the UK would receive a letter of non-compliance. I pointed out to the Commission that other European States had yet o implement the Directive and indeed they had defaulted on the implementation date. I was advised that this didn't matter, we had implemented it and had not followed the proper actions, if other countries had implemented it and had done likewise they too would be sanctioned, but as they hadn't, they wouldn't be! This was a fascinating insight into the workings of the European Commission. Strangely enough the following year when other countries in Europe realised the nonsense of ships passing voluminous and soon out of date manifestos to competent authorities, the Commission changed its mind and adopted the initial UK policy – so we changed back again!

3.6 Political and Cultural Influence, Personality and Rank

I have chosen to combine political and cultural influences together with personality and rank as they are in many ways related; culture can determine the nature of political influence as can the personality and rank of those involved.

It is unlikely that any government organisation will be immune from political intrusion or intervention and maritime emergency organisations are no different. It is perhaps unsurprising that government officials and ministers want to be kept informed of major emergencies and to have their say. However, this can prove harmful to the successful outcome of the operation. I have included the political influence within the C4 framework activity exemplar as without it the map would not be complete. Whilst politicians and government officials are 'people' I have not included hem as such within the framework as I have confined that definition to those that operate the framework whereas politician *et al* are in the environment of the framework.

The impact of political intrusion can result is serious operational failure. For example, during the MT Prestige incident the Director of Merchant Marine acting as commander for the emergency held many discussions with both regional and national politicians as evidenced by telephone transcripts and it was suspected by those observing the incident, including myself, that government influence played a part in the dogmatic approach to the decision to take the ship out to sea come what may. Yet in the many enquiries and consequential legal hearings the Director of Merchant Marine took full responsibility for all actions and decisions. Although he was charged by the Spanish Authorities for the excessive pollution after the ship's master was removed no legal consequences followed. Both he and the master of the Prestige were faced with twelve years in prison yet the Director walked free and the master received a nine month prison sentence. There was much debate about this outcome among those present at the trial, including myself as an expert witness and several hypothesis were put forward but not for inclusion within this study.

During the Multitank Ascania incident in 1999 (Chapter 4 Case Study # 4) the then Secretary of State for Transport insisted on flying over the scene – at the time a chemical tanker on fire and dragging its anchor a half mile from shore and several miles from a nuclear power station. The Fire Master objected as did I, acting as the Secretary of State's Representative

(SOSREP) for salvage and intervention. Nevertheless, he persisted and was eventually flown close to the ship together with the Fire Master. During this episode the coastal farming population of the area had been evacuated because of the potential explosion danger and exclusion zones had been put in place some 2 miles out to sea and 500 feet in the air. Consequently the actions of the minister contravened his own emergency directions and advice from his SOSREP. The matter detracted from the handling of the incident and involved the unnecessary use of valuable resources. The effect of political intrusions cannot be understated. In a note to the permanent secretary for the Department of Transport (1993) in the immediate aftermath of the Braer incident off the Shetland Islands (1993), the Coastguard Agency's Director of Maritime Emergency Operations (DMEO) stated that:

> *"The need for Cabinet Ministers to visit [the scene] is accepted. It is obviously politically most desirable, but it distracts enormously from the handling of the incident and adds increased pressures and burdens on people already overburdened."*

I agree entirely with the latter sentences of that statement but not the first; I consider that any government official, cabinet minister or not, should be positively and actively discouraged from attending the scene. In the same note, there is reference to a junior minister attending the scene and the DMEO is more forceful in his opinion:

> *"A Junior Minister on the scene? Yes, to gauge to [sic] local opinion and look after public relations, and to brief the Secretary of State on those matters. No, if he is to involve himself in the handling of the incident (or is perceived by the local authority to be so involved)."*

There are further examples from my experience, one in particular involving the Sea Empress incident (1996) where this approach was contradicted by almost the same team that handled the Braer incident. After the involvement of several individuals from the Marine Pollution Control Unit (MPCU) briefing the press resulting in confusing statement, the Minister for Shipping decided to take a role and appeared on national and local media briefing on the incident and for which he was less qualified that those who had briefed before him. The result was a contradictory and confusing mess.

Lord Donaldson later resolved the matter in the UK once and for all with the introduction the SOSREP (Donaldson, 1997) and the 'back him or sack him' philosophy – in essence, don't

interfere, either support him or get rid of him. Other nations have adopted the SOSREP approach but have yet in my view managed to isolate government ministers and officials from the C4 Framework in managing MME.

Culture, as expressed by Rozakis (2007), *"has been used to describe a particular population, or a system of ideas associated with social groups"* He goes on to say that *"the former definition has often proved problematic because of the unspecified boundaries such as populations, and the latter might be considered as subculture (Scarman Centre, 2002a)".* I have suggested in an earlier Chapter that culture prevails across several boundaries and can prevail within national, organisational boundaries or groups of individuals. I would even go as far as to say that culture can prevail in an individual and be different than the rest of his or her group. Take for example the master of a ship with twenty or so multi-national crew members none of which originate from the master's country or have had any of his 'cultural' experiences in life. Culture is also dynamic and can change within a group or individual depending upon their life experiences. A migrant for example from an Asian country now resident in the UK for 30 or 40 years may take on some or nearly all of the cultural influences of the UK. For the purposes of MME and the C4 framework I generalize about culture and consider it as the difference between nations and how they approach emergency management; some countries may be autocratic and others open, some may have a rigid hierarchal approach to decision making referring everything 'up the line' and others may adopt a more flexible matrix[9] approach. Culture (and within this I include rank and status) also plays a part in the implementation of the C4 framework as discussed below.

The definition of Command used by Tennant (1982) is interesting in that it considers '*knowledge*' to be the basis for taking charge and achieving objectives. In my experience in a military context it also tends to be the rank of the person giving the orders and their position within the chain of command that permits the exercise of authority. During a liaison visit to the Indian Navy I witnessed the role that caste played in the rank structure – the higher the caste the higher the rank. So culture can play a significant part in the command organisation.

Culture plays an important part in the implementation of the C4 framework and the outcome of an MME. Case study #1 (Chapter 4) was conducted in an environment which was

[9]In this context matrix is the practice of managing individuals with more than one reporting line.

largely dictatorial with no challenges whatsoever on the command. I suggest earlier in this study that this arose because of the background of the commander and the national culture in which he was brought up, educated and developed – under the Spanish dictator Francisco Franco, regime 1939-1975 (History website, 2009). Many of his younger subordinates although brought up within a monarchy and directly ignorant of the Franco culture still resisted any challenge to the commander's authority. The C4 framework was prevalent within the Spanish approach to MME but serious implementation flaws resulted in a disastrous outcome driven by a dictatorial and inflexible commander influenced by his culture and in my view political influence.

In contrast Case Study #2 (Chapter 4) was enacted across both French and UK boundaries yet, due to the good liaison between the commanders in both countries, focused on producing a successful outcome. The French were driven by preventing excessive pollution on their shores and cooperated with the UK to ensure this outcome so command decisions from their perspective were straightforward. On the other hand the UK position was far more precarious resulting in a series of difficult decisions undertaken without political interference (because of the approach adopted by the UK) and within a culture that is open to challenge. A respondent to my survey (Chapter 5) commented "everyone has different opinions and ideas of success." Another commented, "Support for the Incident commander's decision is vital even if you think there is a better option".

KASE (2011) considers business behaviours of Asian versus Western and holds the premise that they have different practices. In his review of the book Holden considers the West to be analytical and the East to be synthetic presumably meaning that they tend to copy what the West does. This implies that the East does not think for itself and I have seen examples of this in India where the IMO doctrine and regulations are followed closely without any real understanding of what they are about. Similarly, the maritime emergency response in Egypt (Case Study #3) shows the basic infrastructure of the IMO maritime principles but a lack of understanding how it works in practice. In contrast to the UK's approach to maritime emergencies I visited a new rescue centre in Ijmuiden, Norway several years ago and was surprised not to see any staff in uniforms and the main operations centre with a break-out area in the middle with couches and a coffee machine. This did not give the impression of efficiency nor an obviously focused operational structure but I have no reason to believe

they are not effective; the Norwegian and likely the Scandinavian culture in general appears more open and relaxed than very many others.

Tennant (1982) describes C3 (Command, Control & Communications) as: "*The knowledgeable exercise of authority in accomplishing military objectives and goals".* In my view this is overly simplistic. However, Tennant (1982) goes on to say:

> *"An important point to realize is that C3 is a human function. The method by which command and control is carried out is the C3 system, which serves to augment the cognitive functions of the individual engaged in command and control. A complex C3 system is an integrated combination of people, procedures, and hardware used to enhance the ability of the individual performing command and control."*

I agree with these sentiments (which could in part be used to describe the C4 framework) in that such systems rely heavily upon human functions as described earlier in this Chapter regardless of the sophistication of the technology that may be employed in support. Tennant (1982) also considers that the C3 system employed must complement the commander. He explains this by saying that one person's tactics is another's strategy. This of course is true and can be expanded to include operations – one person's operation is another's tactic and another's strategy and so on. In a single maritime emergency these three elements together form the approach to a successful outcome; where a person sits in the system, their rank and cultural bias (autocratic or flexible), will dictate their role and their influence on each of these three elements. Clearly Tennant (1982) views C3 in a wholly military context although from my experience some of his approach is unclear. Nevertheless C3 is indeed a vehicle for the delivery of objectives and goals.

Elliott (2015) describes various aspects of command, including other components of C4 but which are not explicitly identified as such, describes the high-level structure that prevailed during the Iraq war including the senior civil servants in the Ministry of Defence (MoD) and the various chiefs of staff. He describes the situation when Admiral Sir Michael Boyce was told of the government's decision to invade Iraq and was told to keep it to himself. However, rumours spread and Admiral Alan West having heard the rumours took it upon himself to move a squadron of ships to the Persian Gulf on the pretext of an exercise – he did not tell

Boyce. Elliott (2015) quotes from West and Sir Kevin Tebbit (then MoD Permanent under Secretary) when Elliott says:

> *"When things started to go seriously awry in Iraq…"*
>
> *"West had a particular worry about the quality of information that was coming up from the deployed forces, the 'ground truth':*
>
> *"We did not get a real flavour of the situation on the ground and never got a feel for how the situation was changing. One felt one was out on a limb [in the Navy Staff]. The weekly chiefs meeting included an Ops briefing, but it was really an information meeting; we were never involved in discussion.*
>
> *In retrospect we were probably complacent [about it]. [Lieutenant General] Rob Fry (Director of Operations) did come to see me twice, but there was no further opportunity to debate it [in committee]."*

In many ways this describes to some extent the reverse of the MT Prestige (Chapter 4, Case study #1) situation, albeit at a higher strategic level, where information coming from the ground restricted those above to understand the operating picture. On the other hand, it seems as though those at a high level in command where not allowed the opportunity to discuss what they did know with their seniors. It also demonstrates poor communication and the lack of a common operating picture (COP).

Richards, (2014) explains an experience he had with the MoD chiefs of staff, also during the Iraq war. Richards (2014) had developed a plan to enhance and develop security in Bagdad during post-conflict operations but when he presented it to the chiefs of staff in Whitehall it was rejected. He was asked about his arrangements for C2 and explained his plans. Richards (2014) recalls that he felt it was rejected, *"…by an officer in a non-operational appointment."* He also makes the point that he was the only officer in the room bar one (who supported his plans) who had actually seen the situation on the ground in Bagdad. Later when the Prime Minister heard of the plan he wanted it adopted, at least in part. Richards suggests that personalities were involved in the chiefs' refusal to accept his plans.

In my work as a Ministry of Defence Review Team Leader heading up high risk trouble-shooting reviews of the management of military projects, programmes and portfolios (P3M), I find that the military officer given responsibility for delivering the business (called the Senior Responsible Owner or SRO) has the 'responsibility to deliver the PM3 but does not necessarily have the authority if his/her rank is junior to others who may play major parts in the delivery. So in the military environment, if status is not aligned with the appropriate rank to carry out a given task, it can prove difficult and sometimes impossible for the individual who has been given the task. In an MME with a more fluid environment a wide variety of ranks and people with different status are brought together for a common goal. Some can refuse to carry out the orders of the commander in overall charge of the MME and even leave the scene; this would be highly unlikely in a military context.

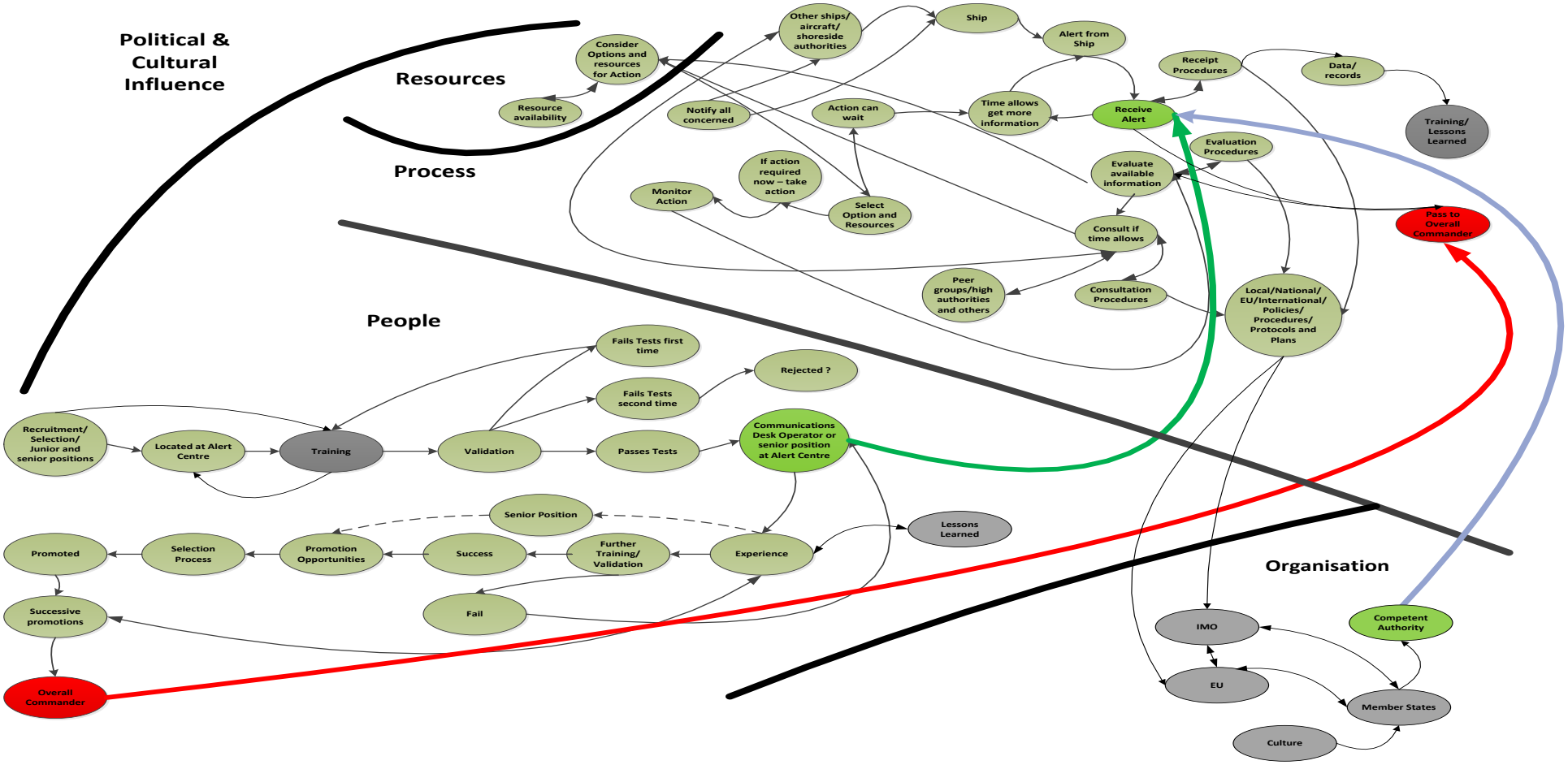
3.7 Activity Map Summary

I have set out the C4 framework in an Activity map, Figure 6, as I have experienced it in my professional practice, including the C4 components together with the overarching elements described above; People, Process, Resources, Organisation, Political, and Cultural influence. There are many aspects of the map which have in themselves many subsets at the same or lower levels which can be complex and diverse (Beer 1975), however, my own viewpoint is that the complexity of managing MME and its C4 framework requires a fundamental structure from which subsets spread. Without such a structure it is difficult to establish points of failure and focus on areas for improvement when things go wrong. As with any other 'map' it takes a traveller (the commander in this case) on a journey to a destination and allows them to identify where they have started, stops along the way and identifies their chosen route. If for any reason a road ahead is blocked, a map gives the traveller the opportunity to find another route. Such is the function of an activity map. In a conversation between Alice and the Cat in Alice in Wonderland (Dodgson, 1865 (Lewis Carroll)) about a particular the direction Alice should take, the phrase was later coined from the conversation, "*If you don't know where you are going, any road will get you there."* In my view it is essential to have a road map, a spine, along which the C4 framework travels to enable the journey to be marked along the route and for the traveller to return to particular points if they get lost. I use the activity map later in this study to compare the key statements derived

from my case studies to derive areas of interest for the improvement of the C4 framework implementation.

I also use the activity map (Figure 6) in later Chapters of this study as an iterative reference source and as a comparator against my public works and professional practice to identify key statements and observations as either F or U to the outcome of an MME.

Figure 6 - Activity Map for MME C4 Framework (source author)



Chapter 4

Career Experience Evaluation against the C4 Framework and Activity Map

4.1 Introduction

At this point I will consider how the C4 framework has worked in practice using my professional experience to evaluate each of my case studies. I have worked in the management of MME and have used the C4 framework for over 40 years'. During this time I have been involved in many hundreds of minor and high profile major emergencies, the construction of national maritime contingency arrangements, maritime organisational change, emergency management training, and the recruitment and selection of maritime emergency management personnel. Against this background, this part of the study draws out key statements and observations from a selection of case studies set out in my PWI (Annex A).

The activity map (Chapter 3, Figure 6) shows graphically the relationship between the components of the C4 framework and their environment within an MME context. In essence it presents a picture of the areas under appraisal and ensures that all key steps in the implementation of the C4 framework are evaluated together with associated influences such as the organisational structure within which it operates. This Chapter therefore matches my professional experience and practice of the C4 framework against the components of the activity map. The results produce a wide range of key statements that are either for or against the successful implementation of the C4 framework in the context of an MME. I chose to identify the key statements and observations as Favourable (F) or Unfavourable (U) to the successful implementation of the C4 framework and the outcome of an MME. The use of a binary approach to identify key statements and observations resulted from consideration of the approach adopted by Wigmore (1913) in his evaluation of legal evidence. Wigmore (1913) used a diagrammatic representation to map and consider evidence in the four basic categories of: testimonial; circumstantial; explanatory, and corroborative and weighted each type according to its strength of argument either for or against a defendant. It was thought by Twinning (1985) that the computer age would make the Wigmore methodology easier to manage and enable great swathes of data to be analysed. I had considered opting for this four-tiered evidence approach in my evaluation of case studies but following a meeting with Uri Schild and a discussion of his work in semi-automation of Wigmore (1913) I decided that the level of analysis required on my material, and which was at best only partially objective, would not produce any more meaningful results than a simple binary approach. Moreover, using the Wigmore (1913) approach in a legal context with a range of weighting options applies only to a single case which

needs to be tested in court does not fit easily with the evidence from my case studies that have already, to a large extent, been tested.

In an MME it is necessary to be as clear as possible whether following a particular course of action is likely to lead to a successful outcome or not. Therefore a commander needs to have a good grasp of principles that will help in his or her deliberations and not principles that may or may not work or fall into a range of options between Favourable (F) and Unfavourable (U). A 'don't know' category included within the key statements and observations, for example, would not therefore, in my view, add any value to the case study evaluation.

I also considered using some form of thematic content evaluation, but concluded that my own intuitive analysis on the basis of experience and practice would best suit the needs of the study. Having applied a computer content analysis tool to some of my paragraphs simply produced a catalogue of word and phrase usage that I had to interpret anyway. In essence, therefore, my approach was to evaluation the content of my case studies to arrive at a list of F and U key statements or observations, then to interpret them into positive principles to improve the implementation of the C4 framework or certain aspects of the framework itself.

4.2 The Body of Evidence – Identification of, and Comparison of, Favourable (F) and Unfavourable Practice (U) from Case Studies

Set out below is the background detail for each of the case studies followed by an analysis of each together with Key Statement/Observation tables. The analysis provided a comparison of Favourable(F) and Unfavourable (U)practice in the C4 framework implementation and the management of MME together with wider element issues (People, Process, Resources, Organisation, Political and Cultural), some of which were taken forward to my brief survey of emergency management professionals (Chapter 5).

It is important at this stage to emphasise that the analysis of the case studies and the opinions about Favourable (F) and Unfavourable (U) practice is purely subjective and they are my own opinions based upon my professional experience and are evaluated as a (exemplar) narrative

analysis[10] (Riessman, 1993); others will doubtless disagree with my opinions. Such is the nature of subjectivity.

4.3 Case Study #1: MT Prestige – A Breakdown of C4

The first example used in this analysis, which places the C4 framework into context, is that involving the *Motor Tanker (MT) Prestige.* The criminal proceedings against the Master, the shipping company, and the Spanish Director of Merchant Marine were completed in a Spanish court in November 2013 and resulted in the case against all defendants, except the Master, not proven. The Master was sentenced to 9 months imprisonment for Disobedience of an order. (The sentence is under consideration for appeal and at May 2016 is yet to be heard). I acted as an expert witness in the criminal proceedings in Spain and advised an International Law Firm for over four years. What follows is a discussion of the incident that is in the public domain and will present an understanding of how and where the C4 framework fitted and the issues it raised. The incident also emphasises the scale of the legal action; 13 years (as at 2015) and three different court cases) and costs circa $6bn associated with what was, in my opinion, a human failure in the implementation of the C4 framework.

On 30 October 2002, the *Prestige* sailed from St Petersburg where the vessel had been carrying out storage duties since June, loaded with approximately 71,000 tonnes of heavy fuel oil distributed equally in all of the ship's cargo tanks (the majority of which later spilled). On 9 to 11 November, the *Prestige* experienced force 6-7 winds mainly from the west or northwest. During this period, the *Prestige* made good an average speed of approximately 11.35 knots (Report to EC, 2003). This shows that the speed of the vessel was not suffering as a result of any engine-related problems. By about 1630 on 11 November, the weather started to deteriorate. By midday on 12 November, the *Prestige* had reached the centre of the Bay of Biscay. She was on a course of about 209º and the wind speed had now increased to force 8 from the west. This wind, coupled with high waves and heavy swell, resulted in the *Prestige* rolling heavily and shipping seas on deck. On 13 November 2002, the weather worsened, with the wind reaching force 9 and at times force 10. Very high waves were experienced and the vessel continued to roll heavily. According to the Master, the *Prestige* was now proceeding at about 5 knots, the vessel having reduced speed due to the bad weather and in accordance with good seamanship.

[10]I define narrative as a collection of past professional practice experiences from my PWI that are facts, recollections or transcripts.

At around 1515 hours on 13 November the ship was damaged by an unknown force on the starboard side. The damage caused resulted in the Master of the ship declaring a distress situation and ordering the ship to be abandoned. All crew where successfully taken off by the Spanish SAR authorities but the Master and his two chief officers (engineer and deck) remained on board to assist with securing a tow to take the ship to safety (Report to EC, 2003).

What followed was a series of judgements and decisions by the Director of the Spanish Merchant Marine, the officer in charge of the emergency and Commander, which led to the pollution of six countries through the release of over 60,000 tonnes of heavy fuel oil (CEDRE, 2011). At the outset (almost within the first 5 minutes of being told about the incident) the Director decided that the ship should be taken at last 120 miles out to sea away from the Spanish coast (Madrid MRCC Telephone transcript, pp. 24, 2002). As the incident progressed over six days he did not change his mind about his initial command decision regardless of the information he received about the option to take the ship into a safe haven and discharge its oil. His attitude at meetings with his staff and others appeared to deny any other options for the vessel other than 'take it away from Spain'. His command decision resulted in the ship breaking up and polluting six countries including Spain and causing significant environmental damage. The financial impact has been substantial; several legal cases costing in the order of $6 billion.

Why the Spanish Director stayed with his command decision and refused to listen to advice or take account of updated information and changing circumstances is difficult to understand (Madrid MRCC Telephone Transcripts, pp. 55-56, 87, 98, 2002). Apparently he was a very experienced officer and his emergency response arrangements were sound enough, but he failed to follow even the most basic Command and Control procedures that were set out within them; see my professional principles set out in Chapter 1. For example, he failed to follow the simple guidance in the flow chart within the Spanish National Contingency Plan (Figure 7) that requires information to be assessed, evaluated, acted upon, monitored, and re-evaluated and so on. Through his failure of command he presided over a human factor C4 framework implementation error of significant proportion.

The resources (controlled assets) under the Director's command included experienced salvors who would have given timely technical advice to the command but they were hindered in their attempts to gain access to the ship (Salvage Master Statement, pp. 97287- 97288, 2003, Fax Uribe/Gheerbrant, 2002, Fax Janssen, 2002, Fax van der Werf/Janssen, 2002). Communications

between the command and the salvors was also sadly lacking. Similarly tugs assigned to the incident were confused about the actions (Coordination of resources)they were supposed to take and which authority was controlling them; the salvors thought the tugs were under contract to them but the Spanish Authorities considered them under contract to the Spanish Government (Annex 3.4 DGMM Report, 2003, pp. 464-502). Thus the Co-ordination of the resources on the scene was less than efficient due to split command and control. Moreover, language barriers (the Master of the Prestige was Greek and spoke little English and no Spanish) and those on the salvage tugs fared little better. Communications were further hampered by power failure on the ship and the necessity to use hand-held radios. The Master was also talking to his owners in Greece via a satellite phone establishing a pseudo command structure out with that of the Spanish Authorities (Master's Statement to European Parliament, pp. 4275). In all, the C4 framework that ought to have played out during this incident failed and nothing was done about it during the incident by its Command. If the Director had any doubts about the course of action he took he did not 'learn to fail' (see principle P4) and revise his options. I feel this incident was handled more politically than operationally and was subject to an undercurrent of political influence. I wonder too whether the Director was subject to the sort of fast thinking (System 1) rather than slow thinking (System 2) as expressed by Kahneman (2011) and his heuristic response (if any) was flawed.

The Master and crew of the *Prestige* were all experienced and qualified to appropriate standards for the voyage undertaken by the *Prestige* and throughout the incident, their actions were most professional and competent in accordance with standard procedures (Report to EC, 2003). A Distress was rightly declared at the outset of the incident and the Master considered that "non-essential personnel" should be promptly evacuated. Following his initial declaration, he quickly assessed the situation and realised that the vessel could be righted. The Master's decision to balance his ship by flooding the empty port tanks 3P and 2P aft was correct and timely in view of the prevailing circumstances and weather conditions and in the absence of any realistic alternative. The relevant aspects of Command and Control were evident on board the ship.

The Master of the *Prestige* acted at all times in the interest of his ship, his crew and for the avoidance or minimisation of pollution as he was under a duty to do by the obligations placed on him by the Safety of Life at Sea Convention 1974 as amended (SOLAS, 1974). As far as the orders of the Spanish Authorities are concerned, there is no evidence of any written, clear and formal "intervention order" or other clear and unequivocal instruction issued by the Spanish Authorities

to either the Owners or the Master (failure of Communication, Command & Control). Such an "order" or instruction would have clarified the position of the Spanish Authorities with regard to any legal "direction" placed on those responsible for the ship and allowed those on board, in particular the Master, to properly understand that they were being given an instruction, what this instruction was and that they were being asked to comply with it or face legal sanctions. In these circumstances and in the absence of a clear order or instruction, I would not expect the Master to understand that he should, immediately and without fail, comply with the orders of the Spanish Authorities. Notwithstanding the fact that the Master did not receive a clear instruction or intervention order, the Master did not fail to comply with the wishes of the authorities. Efforts were made to connect the tow, the main engine was started and the vessel did proceed on the course desired by the authorities (Report to EC, 2003).

The Spanish Search and Rescue (SAR) Authorities acted responsibly and adequately to the Distress and promptly and professionally evacuated 24 personnel to safety, demonstrating that subordinate (SAR) C4 within the Spanish system functioned well (Transcripts Ch. 11, 2002).

The response of the Spanish Authorities to the salvage operation, however, I find to be confused and wholly unprofessional. From the substantial evidence I have reviewed it is clear that, from the outset of the incident, the authorities had only one intention and that was to ensure that the *Prestige* was taken far away from the Spanish coast without any regard for the consequences. This remained their objective throughout the incident until the *Prestige* sank on 19 November 2002. There is no evidence to suggest that any timely and proper risk assessment, together with "what if scenario" oil drift modelling, was carried out to mitigate the deteriorating situation and in order to form any objective decision-making (CEDRE, 2011). In fact, the evidence sighted indicates that no meaningful risk assessment was undertaken.

The Spanish Authorities did request Météo-France (through the National Institute of Meteorology, CEDRE, 2011) to "monitor" the spill from the *Prestige.* This request was apparently sent by fax (not located). However, even though the text in the faxed report on marine pollution (POLREP) (Fax Prefecture/MRCC Madrid, 2002) used the word "modelling" for pollution prediction, this was not carried out. There was no attempt by Spain to request that Météo-France predict what would happen to the oil if the vessel sank out at sea, that is, where the ship was being taken. For example, modelling ought to have been done as part of a formal risk assessment at the outset of the incident when the decision was taken by the Spanish Authorities to take her

out to sea and then at, say 60, 90 and 120 mile stages *en route* to the desired destination, taking into account the structural state of the ship and the forecast weather conditions (Marine Met. Report, 2003). Instead, the modelling carried out by Météo-France (CEDRE, 2002) was to predict the outcome of the oil drift that had already spilled from the *Prestige*. According to the relevant POLREP (Fax Prefecture/MRCC Madrid, 2002), an oil slick was forming around the vessel which was said to be 2 nautical miles in length. This supports the view that only one option (sending the vessel out to sea) was acceptable to the Spanish Authorities and that even this critical decision was not risk-assessed.

The Spanish NCP was activated although it is unclear from contemporaneous documents when this was done. This is only clarified in post-incident documents (Annex 6.8 DGMM Report, pp. 1123, 2003). Similarly, it is unclear how local and regional plans interfaced with the Spanish NCP during the incident. The lack of clarity on this point is also reflected in the contemporaneous phone/VHF transcripts themselves, e.g. the Spanish themselves were unclear as to how the Spanish NCP and sub-plans should be activated and how they should work in practice (Telephone, 900202202 and Ch. 11 & 16 Transcripts, pp. 12823-12848, 12956-13003, 12849-12881). The Spanish-French ”Biscay Plan” was activated at 1200 but many of the actions required under the Biscay Plan do not appear to have been taken by the Spanish Authorities, in particular, the consultation with the French Authorities about ”intervening” in the incident and consultation about related salvage action (C4). Confirmation of the Biscay Plan activation is also given by Vice Admiral Jacques Gheerbrant, French Atlantic Maritime Prefect in his evidence to the Maritime Police Force of Brest (Statement, 2003). He also comments on the good relations between the French Atlantic Maritime Prefecture and the Spanish Maritime Safety Agency (SASEMAR) before and during the *Prestige* incident.

However, in his evidence to the Maritime Police Force of Brest, Mr Guillaume Lambert, Naval Commander at the French Atlantic Maritime Prefecture (Statement, 2003), who acted as a liaison officer within the framework of the Biscay Plan and who was in Spain from 16 November to assist the Spanish Authorities, mentions that it was the French Authorities who actively took steps to get Spain to trigger the Biscay Plan in order for Spain to use French aerial resources.

At this point I will take issue at the use of the word ‘Plan’ when used to describe national contingency ‘arrangements’. A dictionary definition (Oxford) of Plan describes it as *“a detailed account or proposal of how something can be done or achieved”* or *“to arrange something in*

advance". The national contingency plans I have read tend to describe the liaison arrangements between key players, contact arrangements and so on. They also describe how the organisation works together with its responsibilities and those of others. What they don't do is set out 'plans for action'. This is invariable because they do not know what the aim or objectives of the plan might be. In a military context it is possible to determine a plan in advance of an operation as the aim and objectives can be known to some extent. However, as Helmuth von Moltke remarked (Barnett, 1963), *"No plan survives contact with the enemy"*. He also commented, *"When your plan meets the real world, the real world wins".* These are very interesting observations and ones that I have regularly made throughout my career – clearly I didn't observe them first. They are worth bearing in mind when formulating national contingency plans for the management of MME. I would prefer to rename such plans as National Contingency Arrangements (NCA) and I am not even sure that 'contingency' is the right word and would prefer 'Emergency Response', thus leaving the title, 'National Emergency Response Arrangements (NERA)'. With regard to MME, the title would be NERA for MME; I believe this is more appropriate than NCP, others may disagree. My views on plans are reflected in my principle P5.

The components of C4 in terms of its categories of people, process and organisation can, to some extent, be included within the NERA but not the enactment of C4 in terms of incident management given a particular emergency. Such matters are best left until the emergency occurs and the 'right people' are in the 'right place' to deal with it. Attempting to pre-empt emergency responses and cataloguing within a plan the range of actions to be taken will not as von Moltke remarked(Barnett, 1963) *survive contact with the enemy* (the *enemy* being the MME in the case of this study).

The Spanish Authorities' relationship with salvors, SMIT, was inflexible and unsatisfactory (Telephone Transcripts, Koffeman, 2002). By insisting that SMIT sign a document agreeing to take the *Prestige* out to sea before being allowed to board the ship and assess the situation, the Spanish Authorities tied salvors' hands in terms of any salvage plan. In short, the Authorities had no regard for the technical advice that SMIT had to offer (Annex 6.8 DGMM Report, 2003) despite their vast expertise in this type of incident. SMIT were belatedly sent to the ship with the sole purpose of fulfilling the Authorities objective, to take the vessel as far away from the Spanish coast as possible.

It is argued by the Spanish Authorities that technical advice was available from their representative sent on board the *Prestige*. However, the ”technician” chosen was an engineer and not a naval architect or structural surveyor which necessarily limited the type of feedback that he was capable of giving and that could reasonably be expected of him (Statement Regueiro, 2002). This, coupled with other evidence (as highlighted in contemporaneous phone/VHF transcripts and in the representative's statement to the Corcubion Court, 2003) strongly support the position that the engineer was not dispatched for technical advice at all but instead purely to ensure that the ship's engines were started to speed her on her journey seawards. His lack of technical competence to assess the condition of the vessel and his lack of instructions to do so would explain why the technician did not attempt to assess the actual condition of the vessel.

Studies since the incident, such as that by the International Tanker Owners Pollution Federation (ITOPF Fund Document 92Fund) have shown that had timely action been taken on 13 November and no more oil had been spilled the outcome would have been much different. This study shows that had the *Prestige* been taken to a place of refuge during the relatively calm weather window of 14-15 November 2002, far less pollution would have occurred than was the case (CEDRE Forecast, 2011).

It is clear from the evidence reviewed, that whilst the *Prestige's* situation from the outset was severe, it was also salvageable. Even without oil modelling, a formal risk assessment and the benefit of hindsight, both the Master and salvors recognised that refuge was a realistic (and indeed the best) option. Tragically for the environment, however, the Spanish Authorities failed to recognise this or heed salvors' expert advice. Consequently, this severe situation was made into a catastrophe by what I consider to have been the Spanish Authorities uncompromising stance.

The refusal by the Spanish Authorities to grant the *Prestige* a place of refuge, after several requests from both the Master and salvors, compounded the structural damage to the ship and caused her to break up and eventually sink, causing massive environmental pollution.

As a closing observation, it is extremely unusual for all those attending a crisis cabinet meeting (Spanish Crisis Cabinet (CECOP) activated on 14 November 2002) to agree that all actions taken throughout a particular incident were correct and, moreover, for each member to be invited to confirm this agreement by signing the minutes of the meeting in question. All attendees at the CECOP meeting on 19 November 2002 (Annex 6.3/6.8 DGMM Report, pp.1103, 2003), however,

were invited to sign such a declaration on the final page of the minutes of that meeting on the very day that the vessel broke up. To require such express confirmation validating the actions taken in response to the casualty suggests that authorities expected criticism for their actions. It should be noted, however, that the CECOP minutes for 19 November at 1230 are entitled "*Minutes of the Technical Meeting Held in Response to the Prestige Casualty*" (Annex 6.8 DGMM Report, 2003) which means that the meeting was not attended by the entire membership of the Crisis Cabinet. Interestingly, the version of the minutes eventually signed by those attending does not extend to agreement as to the correctness of all the actions taken since the start of the incident; it seems that there was a modification to the last paragraph of these minutes to the effect that the agreement only referred to the matters discussed on 19 November. The modified paragraph as finally signed by the attendees provides that, "*All those attending consider that the measures adopted by the Spanish maritime authorities, with regards to that indicated in the minutes, have been the correct and most adequate measures in response to the successive situations that have occurred since the start of the Prestige casualty*." The same extract can be found in the Director General's report in the section dealing with the events on 19 November and in particular, the section entitled "*Favourable opinion of the group of experts regarding the decisions taken*".

It should also be noted that there are two copies of minutes for the meeting on 19 November which form Annex 6.8 of the DGMM Report, 2003. One version has been qualified to cover only the matters discussed on 19 November and was signed by all the attendees, the other containing the "original" statement regarding the actions of the Spanish Authorities throughout the casualty has only been signed by the Director General and the Secretary. The existence of this qualified copy is curious and infers that some of the attendees may have refused to give their blessing to all the actions undertaken by the Administration and that only The Director and the Secretary were prepared to say that all the actions of Authority throughout the casualty were correct. It is also surprising that the crew from the POLMAR 2 aircraft were invited to sign the minutes to endorse the actions of the Spanish Authorities.

4.3.1 Identification of Key Statements/Observations

The Spanish Authorities had in place a National Contingency Plan for dealing with such incidents as the *Prestige* that subscribed to the current C4 framework. However, the outcome was a failure that resulted in significant environmental pollution. What follows examines why the

Spanish C4 framework implementation was unsuccessful. Figure 7 shows the decision diagram featured in the Spanish NCP. Figure 7 will be used in conjunction with the Activity map at Figure 6 as a basis for the analysis of evidence using an similar approach (in terms of evaluating evidence but not scoring or weighting it) to that developed by Wigmore (1913) through his evidential diagrams to map arguments from observable evidence either in favour or against the 'defendant' in legal proceedings. In this case the 'defendant' is the implementation of the C4 framework during the management of the *Prestige* incident (and later other case studies).I have not used the strict interpretation of Wigmore (2013) evidential diagrams, instead I have drawn up simple key statements/observations that I have identified as F or U to the success of an MME. are drawn up setting out basic evidence against each of the components of C4 in the context of the elements of Figure8 as they apply to the Activity Map (Figure 6). A detailed Wigmore (2013) approach was adopted by Chalamish *et al.* (2013) in an attempt to computerise the evidence for and against in an evidential process. At a meeting with Schild (mentioned earlier) he explained the approach but admitted that they were some way off computerising the whole method. Schild also mentioned that to his knowledge no one had actually used Wigmore (2013) in a live court environment. The volume of evidence within my case studies to be analysed was too great to use anything other than a basic approach and not that set out by Chalamish *et al*. (2013). Matching theory with reality in terms of data volume for such a detailed analysis was unrealistic. Therefore, I carefully selected the evidence from that presented below and reduced it to simple, albeit subjective, statements.

Each list of key statements/observations is drawn up under each of the C4 framework components and matched against the elements of Figure 7 (Spanish NCP Decision Process) as they are to be found in the exemplar activity map to produce Favourable (F) and Unfavourable (U) issues for the C4 framework. The production of these Favourable (F) and Unfavourable (U) lists enabled the balance of argument either in support or otherwise of alignment with the currently accepted C4 framework approach in the activity map (Figure 6). Each category within the C4 framework component identified in the lists is scored and developed into a matrix to assess the balance of issues.

It is interesting to note that the simple decision tree has similarities with the Headquarters Effectiveness Assessment Tool (HEAT) model described by Alberts and Hayes (2006) and formerly by Hayes *et al* (1983) shown in Figure 8.

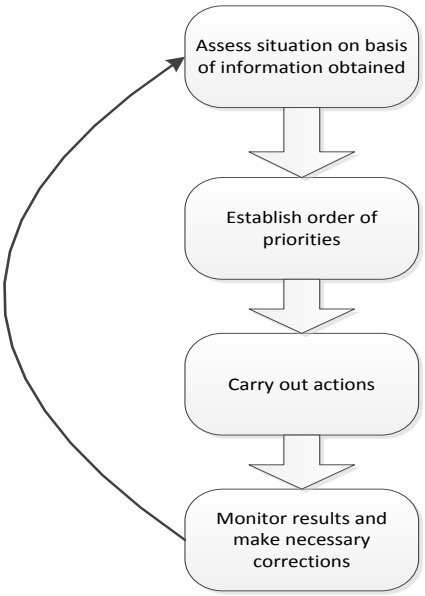


Figure 7 - C4 Decision Tree (source author after Spanish NCP circa 1990)

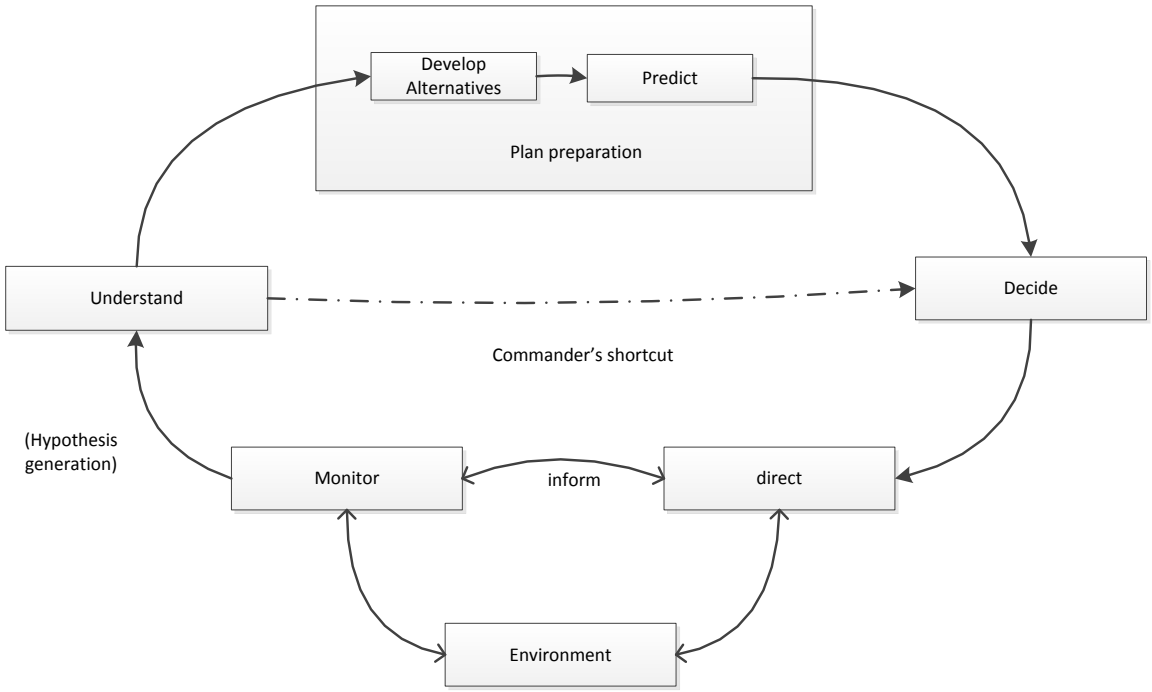


Figure 8 - HEAT Model (source author after Hayes *et al*. 2006, 1983)

The following is comment on the above sequence of events as they occurred and are applicable to the implementation of the C4 framework.

At the outset of the *Prestige* incident on 13th November 2002 the Spanish commander (Director General of Merchant Marine) made a decision to take the vessel 120 miles out to sea and sink her within almost the first five minutes of being informed. That decision prevailed until the vessel sank on 19th November. At the Spanish MRCC, the view of its Head was that he was "optimistic" about the Prestige. This reveals that he had not grasped the seriousness of the situation shown by this following telephone extract with the Emergency Situation Infrastructure and Monitoring Department (Transcript DISSC and Madrid MRCC, 2002):

> *"DISSC: So it's going to be serious is it?*
>
> *Head of MRCC: "No, well, I don't think so. I'm very optimistic. But we've got to be prepared for any eventuality."*

The comment by the Head of the MRCC also implies that they ought to have been prepared for any eventuality; this should have included a place of refuge as an option.

Within the Spanish NCP, there is a simple decision tree (Figure 7) that requires information to be analysed before taking action and for those actions to be monitored and revisions to the actions taken. This was not done despite it being a requirement of the Spanish NCP. Instead, the decision taken by the Spanish Authorities at the outset is encapsulated in the exchange of dialogue between The Director and the Head of the Madrid MRCC on 13 November at approximately 1625, only an hour or so after the initial Distress, established their approach very early on in the incident as indicated by the following exchange (DGMM and MRCC Madrid, 2002):

> *"Director General: Hell, I can't think of anything else, except to pray.*
>
> *Head of MRCC: Yeah, that as well and that it just sinks…"*
>
> *A further extract from the same conversation confirms this approach:*
>
> *"Director General: The watchword is to secure the vessel and pass a towline and take it away from the coast until it sinks."*

The following extract from a conversation between the Director General for Civil Protection (DGCP) also with the Head of the MRCC shows that he too was of the same opinion as The Director:

"DGCP: What we've got to do is get it and take it out to sea so that it sinks."

These conversations at such an early stage of the emergency were not objective and corresponded more to a knee-jerk reaction than any serious plan of action.

The competence of The Director is once again called into question during a conversation with the Head of the MRCC where he (The Director) fails to appreciate the time it would take a tug to travel 40 miles in the given direction and in the prevailing weather:

"Director General: And when will the IBAIZABAL II arrive?

Head of MRCC: The IBAIZABAL II, well with things as they are and the fact that it left from Coruña, it will still take quite a while to arrive. The IBAIZABAL II will be about 40 miles away….and, well.

Director General: Five hours.

Head of MRCC: How many?

Director General: Five.

Head of MRCC: Five! No, no, a lot more."

An indication, albeit small, as to the lack of professionalism embedded within the Spanish Authorities and in The Director himself, is perhaps shown in the failure of the Duty Officer at the DGMM to be available in the first instance to the MRCC and the following extract from the MRCC telephone transcript. The lack of fundamental compass knowledge by The Director revealed within this conversation is astounding:

"Head of MRCC: The wind is southwestly (sic) but, according to the radar, the drift is taking it on a course of 125.

Director General: What's that? I'm not a seaman.

Head of MRCC: It would be like twenty past four.

Director General: OK. OK."

To make competent decisions it is reasonable to assume that those responsible for managing an MME would have at least a basic maritime knowledge. There is a view among some managers that credibility within the field they are managing is not important and that any manager can manage anything, any situation, and any organisation. In my experience this view is unhelpful when dealing with emergencies involving life. Credibility among one's peers is an important attribute among commanders. A detailed operational knowledge to enable commanders to operate technical equipment is unnecessary but it is essential that commanders understand the basic principles and nomenclature of the field in which they are operating.

On 13 November at around 1830, the Master was ordered to accept a tow from the Spanish Government tug Ria de Vigo. He is said to have wilfully disobeyed that order. However, no clear legal order was given**.** During major operations it is essential that orders given by the responsible authority via the commander are clear and have a firm basis, that is, if the order is being given by the State its legal status should be clearly set out in the order.

The documentary evidence showing the sequence of events reveals that one of the initial conversations with the Master (described as "PRS" in the transcript below) was misunderstood by Finisterre Traffic/Finisterre MRCC (described as "FT"). When the Master indicated that the approaching tug (Ria de Vigo) was not to take instructions from him but from Owners. The Authorities mistakenly thought he was refusing to listen to their instructions (EC Report, 2003, MARE Delegation, 2004):

"FT: Ok, your intention is remain on board. Ok be advised, be advised, that a rescue boat, rescue tug boat, is arriving to your position, is just in three nautical miles from your position, and you came give them the line, to be towed. We will appreciate. Is possible? Over….We.....You to give, to be towed Sir, because your vessel is in a very, very bad situation Sir. You have to be towed because you are drifting to the Spanish coast. Over.

PRS: .....the tug boat receive orders from owners, no from me.

FT: Ok Sir, ok, be advise, just we, we, will oblige you to be towed by tug boat, because you are drifting to the coast, you are drifting at one mile per hour Sir.

PRS: Yes, I know, I know, just now the owner preparate [sic] to give the order to tug boat to coming to give me assistance.

FT: Ok, the Spanish Authorities, the Spanish Authorities, order you, order you to be towed by the tug boat, by the rescue tug boat, that is arriving at this time to your position, you have to be towed by this tug boat, please collaborate with the towed, with the tug boat. Over.

PRS: Moment, moment, I want talk again with my owner; I want talk .....again my owner and after give orders.

FT: Ok, contact your owner, mean while [sic], but the tug boat is arriving to your position, to your position and the Maritime Authorities oblige you to give the line to be towed. Over.

PRS: Yes, if received order, be coming on board the crew from the tug because no crew on board, no to give the ropes to the tug boat. Just a moment. I contact again with my ones [sic].

FT: Ok, you may contact with your ones [sic], go ahead….

FT: Let's see, this is the situation. We have now evacuated seventeen, plus seven, twenty-four, and there are three still on board, the Master, Chief Engineer and someone else who do not wish to abandon ship, they do not want to abandon ship. We are telling them on the ship – as the Ria de Vigo is now arriving – to deploy the emergency tow but they are saying that they do not receive orders and that they only receive orders from their Owners.

CNCS: So they don't want to take tow either…

CNCS: So there were 24 crew and there are now three on board who don't want to abandon ship and... refuse to be towed until their Owner says so...

FT: Exactly."

As the above extracts show, the authorities appeared perfectly content for the Master to consult with his Owners before accepting the towing request. This reaction on the part of the

Master was in my view entirely reasonable in the circumstances and would likely be the reaction of most masters. The Master would not have been clear as to his situation with regard to accepting a towline. He would not have known if the Owners or managers had commissioned another tug to deal with the ship or what obligations he was entering into with the Ria de Vigo. It was therefore normal for him to speak to his Owners before accepting a towline – this is common practice and did not appear to be apparent to the Spanish Authorities. Once he had received confirmation from his Owners about the salvage situation, at around 2130 on 13 November, the Master readily accepted the tow provided by the Ria de Vigo and showed keenness in assisting the Spanish Authorities in making fast the tug.

The difficulty in communicating with the Master of the Prestige should have been clear to the Spanish Authorities and the services of a translator should have been secured. It is quite pointless trying to get by with Pidgeon English to the detriment of clear communications during vital operational situations. Even though English is considered to be the language of the sea its use when foreign translation is available can prove irresponsible. In this case it led to the prosecution of the Master. A straightforward and clear intervention order should have been issued in accordance with the Intervention Convention. Moreover, it should have been issued in Greek and Spanish as well as English to both the Master and his shipping company and made available to all Spanish authorities.

The position of the Ria de Vigo was far from clear. SASEMAR had awarded Remolcanosa (Spanish shipping company) a contract for the use of the Ria de Vigo as the emergency towing vessel for the Spanish North Atlantic under contract since 12 November 2002, one day before the *Prestige* incident. The contract arrangements provided for the full availability of the tug throughout the contract's duration. The contract described SASEMAR as the body competent to give orders in relation to the use of the tug for assistance, salvage and pollution prevention and did not envisage the usage of the tug in a private salvage arrangement. This would have been unknown to the Owners and Managers of the *Prestige* who were told by SMIT *"that we will take over the Ria de Vigo (of our Spanish partners)"*, meaning that any possible claim from their side will be absorbed in our Lloyd's Open Form contract. In a further FAX to the owners, SMIT stated that *"SMIT Salvage got a full go ahead from Sasemar to use the Ria de Vigo under our LOF 2000 (Lloyds Open Form) contract in order to establish the situation."* Despite these explanations by SMIT, the Spanish Authorities appeared to retain control of the Ria de Vigo regardless of the salvage agreement and this caused a degree of confusion between those concerned with the

operation. It remains unclear whether the Spanish Authorities knew that the Ria de Vigo was acting under salvors' instructions and on the basis of a private salvage contract (Annex 3.4 DGMM Report, 2003).

It was clear that confusion arose as to who had control of the Ria de Vigo and for what purpose. The contract with the Spanish Authorities for the tug was very recent and it seems that this arrangement had not been communicated to those dealing with the incident. What was also unclear was that the tug could have been used by SMIT under a LOF even though it was contracted to the Spanish Authorities. Therefore, communications and control of the tug was poor.

There was confusion too over the other tugs considered helpful to the situation. The tug *Remolcagure Bat*, initially thought to be available and said to be *"heading out"* was found to be in dry dock as was the tug *Pau da Luz*, indicating that the Spanish Authorities did not have a grasp of the resources available in the event of an emergency.

The Spanish Authorities did not appear to have a true appreciation of what was happening on board the *Prestige* and attempted to control the situation entirely from shore. The situation aboard the vessel was hazardous and difficult and the master could not be expected to be standing by permanently on the bridge of his ship waiting for them to call. The duties of a master in such a critical situation are many. In my experience it is wrong to assume what is happening on board a ship; the only people who know what is actually happening, and even then with some difficulty, are those actually on board the vessel. Throughout my career I have experienced many, albeit minor, emergencies where shore-based commanders have readily assumed that 'they know better' that those at sea and as a result those at sea have paid the price.

Throughout the incident the involvement of the salvors, Smit, was hampered by the Spanish Authorities and their advice was mostly ignored. It is worth noting that on 14 November 2002, the Professor of Marine Safety, University of La Coruña was asked by the Harbour Master of La Coruña about lightening operations for the *Prestige* (Statement of Mayan to DGMM, 2003) The professor gave his opinion on lightening the vessel in its current position and in the prevailing sea and weather conditions. He was asked to compile a report supporting his advice – this was not completed until 19 November 2002; the day on which the vessel sank. He was not invited to consider alternative options. Given the circumstances of the situation, I believe it is unsurprising

that the professor gave negative advice. Also, the senior pilot of La Coruña, was asked by the Harbour Master about bringing the *Prestige* into La Coruña. This was early in the morning before the weather abated. In the prevailing conditions, he advised against such an operation. Neither source of advice, from the professor or harbour master was subject to a technical appraisal or risk assessment, they were simply brief telephone consultations. The advice of the salvors with regard to these actions would have proved invaluable. However, even if it had been called for it is doubtful that it would have been accepted or even listened to (see Chapter 6 and principle P3 about consultation)

The decision by the Spanish Authorities (Director General) to take the *Prestige* out to sea and keep her there doubtless turned a challenging, but salvable, situation into an environmental disaster. There is no evidence of any risk assessment or any mitigation strategies to deal with the incident, as were required under the Spanish NCP decision tree (Figure 7). It would at least have been expected that The Director would have asked for some form of analysis to understand what options where open to him in dealing with the Prestige. Within the Spanish NCP, decision tree there is a requirement that information is analysed before taking action and for those actions to be monitored and revisions to the actions taken as necessary. Evidentially this was not done. The Commander carried on with his initial decision regardless of any information to the contrary – he did not 'learn to fail'. It would appear that his attitude to command was one of autonomy and that he would not allow his decision to be questioned by subordinates. It is interesting to note that in the months following the incident the Director General insisted that all decisions were his and his alone and he did not have any interference from government ministers. I consider this to be unlikely given the Spanish attitude to environmental incidents.

An opportunity presented itself on 14th November with a weather window. This opportunity was not grasped by the commander. A damning appraisal of the situation on 14 November, and an example of my principle P2, is given in the following extract from the MRCC when talking to the helicopter Helimer Galicia on VHF (Annex 3.2, DGMM Report, 2003):

> *"FT: Well, look, the orders seem to have got a bit mixed up, OK whatever they say, Madrid said they were going to the Chaves, then they said they weren't, and now they're to go to the Chaves, to the Chaves, over….One moment Helimer, we'll call Madrid,*

because as I was saying here…it's going backwards and forwards and everyone saying different things and in the end we don't know if they're have to go or not."

What was required on 14 November, was to set the *Prestige* on a course that limited further structural damage to the ship and to head her to calmer waters and, ultimately, to a safe haven. It is difficult to believe that not one of the CECOP Crisis Cabinet members considered at some point that a place of refuge was the best option for the damaged ship.

During the weather window on 14th November the Spanish Authorities had the option to take the *Prestige* to a place of refuge. This together with the minor loss of oil, as acknowledged by The Director himself within his CECOP meeting, missed a golden opportunity. I have observed the video footage taken by the helicopter Helimer Galicia during its first mission on 14 November 2002 (1300-1620 UTC) and it appears that the weather conditions had moderated. Indeed, this is confirmed by the helicopter's SAR Operating Report for 14 November indicating that the sea was "moderate".

With regard to the treatment of the salvage team by the Spanish Authorities, this is so incomprehensible that it could be said to be a cynical delaying tactic to prevent the team from getting aboard the *Prestige* and making a proper assessment of her condition with a view to taking her to a safe haven. At the very least, it was an incompetent decision brought about by a convoluted line of communication and perhaps too many decision-makers becoming involved at various official levels. Following the signing of the letter by SMIT promising to keep the vessel 120 miles off the coast, salvors suffered a further delay; this may be connected with Spain's wish to capture the Master immediately. The Director wanted the helicopter taking salvors to the ship to return with the Master whilst the Salvage Master wanted the Master with him in the ship. This can be seen from The Director's statement to the Spanish Court, quoted below (Report to EC, 2003):

"Q. Was it true that the deponent [The Director] told the English lawyer that they should hand over the Captain immediately and should disembark the same?

A. This was not the case, nobody was asked to be handed over. What was requested was that the rescue helicopter that was going to the vessel with a Captain on board, should leave the vessel together with the Captain of the Prestige as he did not have to remain on board and to bring all information from the ship that might be useful for the effective

salvage of the ship and pollution control, including the sample bottles of the ship's cargo that are required to be carried on board and the ship's log.

Q. Why did the deponent state that he would not allow the Smit salvors on board the Prestige unless they telephoned the +shipowners to attend to the petition to hand over the Captain of the Prestige?

A. It is necessary to clarify the preceding question with regards to the handing over [of the Captain] to the extent that the deponent could not prevent the salvors from boarding a vessel and the only element of truth in the question is that as they could not take the decision to disembark the ship's master in order that he serve as some use where the emergency was being tackled, they could at least attempt the same through their company and the shipowners, but even this did not lead to any collaboration."

In his statement the Salvage Master (Statement at Rotterdam, 2003) is clear that he required essential crew, including the Master, to remain on board the vessel. The pilot of the helicopter tasked to take salvors on board the Prestige had been told to evacuate all the crew during his task to embark salvors. This order was revoked by the Sasemar Operations Director at 2130 but before the helicopter departed, the pilot received a telephone call from an unidentified person countermanding Sasemar Director's order and reverting to the original decision (Helimer Galicia Report, DGMM Report, 2003). In his statement, the Salvage Master also questions who could possibly be senior enough to overrule the Sasemar Director and states that this burning question was not explained to him.

The involvement of salvors within the advice process of a maritime emergency is invaluable. Without their involvement, those leading the operation will be operating without vital information about the casualty. In the UK, for example, as I will show later, the establishment of a Salvage Control Unit (SCU) comprising, amongst others, the Salvage Manager, who has communication links with, and represents, the on board Salvage Master provides essential information to the commander. In the case of the *Prestige*, The Director divorced himself entirely from salvors and the benefit of vital advice. Instead, he and his officers prevented salvors from carrying out their work. The Director relied upon the advice of the Spanish technician, a totally inappropriate substitute for highly experienced salvors whose instructions were, in any event, to start the engines and not to assess the damage to the ship. Two days

therefore passed during which no proper technical advice was sought or obtained. Again, this was another missed opportunity.

The direction to the salvors that they had to sign a declaration to take the Prestige 120 miles from Spanish waters was inaccurate. Given the extent of Spanish waters, a 200 mile European Economic Zone (EEZ), the direction meant that the ship should be taken 320 miles out to sea and not just the 120 initially indicated. This is yet another indication that the Spanish Authorities had no clear idea about the instructions they were giving.

It is clear that the advice of SMIT (Statement at Rotterdam, 2003), one of the most competent and experienced salvage companies in the world, was neither wanted nor heeded by the Spanish Authorities whose unswerving intent was to take the *Prestige* away from its shores as far and as quickly as possible in the misguided belief that this would prevent pollution of its coasts. SMIT was not given the opportunity to engage in dialogue with the Spanish Authorities to determine a salvage plan for the *Prestige.* In an operation such as this, it is usual and accepted good practice to take into account salvors' views before deciding upon a course of action. Clearly, the Spanish Authorities had no intention of doing so, to the detriment of the ultimate outcome, nor were salvors given any rationale for the decision to deny a place of refuge. The window of opportunity over 14 November until early on 15 November was missed. During this time, the weather slackened and the pollution was minimal.

As part of its response to major maritime incidents involving pollution, the UK has its own scientists and oil spill computer modelling (OSIS – Oil Spill Information System).This is used immediately to anticipate actual or potential spill drift and to model a range of outcomes as part of a formal risk assessment within the command and control decision-making process for the commander. The Spanish Authorities did not have such a facility at their disposal and this inevitably weakened their ability to assess possible options. Although France had such capabilities and Spain could have asked for assistance in this regard. Indeed, the UK too could have been asked for assistance. It is essential that in managing any MME the advice of competent authorities can prove invaluable.

It ought to have been clear to the Spanish that the *Prestige* was in a very serious condition and that continuing to tow her out to sea would end in a pollution catastrophe. However, as no modelling had been done to anticipate the effect of such action, the Spanish Authorities were not in a position to properly assess the situation in any meaningful way.

The need to contain the deteriorating situation should have been clear to the Spanish Authorities. If the adverse effects of their dogmatic approach to decision making weren't obvious by this point, it is doubtful that they would ever be clear. Such adverse effects were proven by ensuing events and it is clear that opportunities had been missed and the chance to grasp the situation had been lost.

The actions of the Spanish Authorities, demonstrated that they had no clear understanding of the ship's situation and the effect that starting the engine would have on her structure in the prevailing weather conditions. It also shows that the Spanish Authorities had not liaised with the Portuguese Authorities in advance of the *Prestige* approaching their waters; something that this Expert would have expected given the high profile situation of the incident. Perhaps the lack of command and control of this incident can be summed up by quoting a conversation between Finisterre Traffic/Finisterre MRCC (FT) and the Regional Emergency Centre at 0833 UTC on 18 November (Telephone Transcript 900202202, 2000002):

> *FT: "It's not that its [sic] getting beyond our grasp, but simply that this is beyond the grasp of anyone."*

From the outset of the incident, the Prestige was towed over 200 miles in several directions to the detriment of her structural condition, consequently sinking on 19 November and causing significant and extensive pollution of the Spanish and French coasts (Figure 9). This figure clearly shows that the best opportunity to take the vessel into a place of refuge was during 13-14 November 2002 when she was closer to shore and there was a preferential weather window.

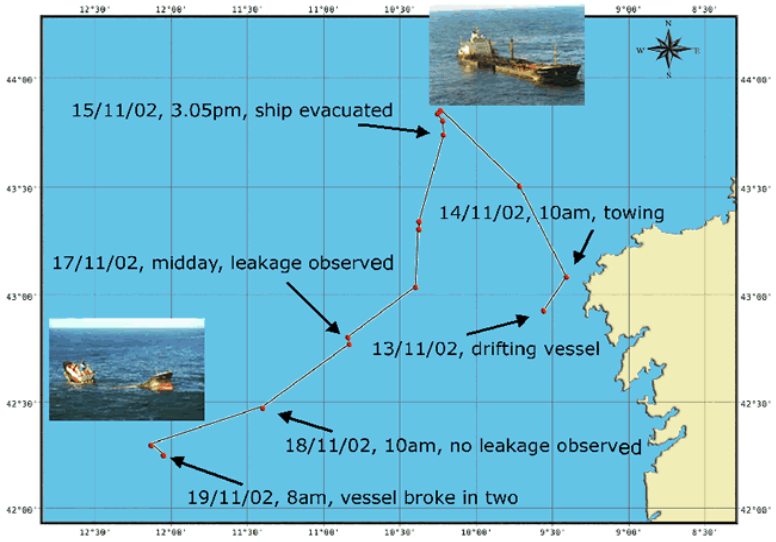


Figure 9 - Map showing movement of the MT Prestige (source French Customs)

It is interesting to note that throughout the incident the commander was not questioned by his subordinates. In my view this is an example or national, corporate and group culture which prevented the equivalent of cross-cockpit gradient (see principle P3,). The national culture of Spain during the years 1936 to 1975 was totalitarian and autocratic as the government was under the Franco regime. It is perhaps no coincidence that the commander of the *Prestige* incident was born at the outset of this regime and was brought up within in it. Although the national culture had changed in 1975 with the death of President Franco, many organisations likely still maintained the hitherto culture for a long time after – old habits dies hard. The leader of the 'maritime corporation'-the Director General of Merchant Marine (Commander for the *Prestige* incident)– maintained an autocratic culture and this doubtless led to his staff accepting his orders unquestionably even though they knew he was wrong. This is borne out by testimonials in the wake of the *Prestige* incident. In essence, processes were in place, supposedly to prevent such autonomy prevailing but similar to CRM in the aviation industry this does not outweigh overpowering cultural factors.

Table 1 sets out the key statements/observations for the MT *Prestige* incident. Some categories reflect more than one aspect of the key statements.

Table 1 - Key Statements/Observations MT *Prestige*

Key Statement/Observation	Component: Command (Comd) Control (Cont); Communication (Com); Coordination (Cord)	Category: People (PE); Process (PR);Politics (PO); Resources (RE); Culture (CU); Organisation (O)	Favourable(F)/ Unfavourable(U)
On paper/CV of commander good but not seemingly borne out by actions.	Comd	PE/CU	U
Refusal to take account of updated information and changing circumstances	Comd	PE/CU	U
Experience in C4 matters lacking	Comd	PE	U
Refusal to acknowledge other people's experience (e.g salvors).	Comd	PE/CU/PO	U
Lack of experience in 'learning to fail fast' – re-assess and re-evaluate	Comd	PE	U
No evidence of knowledge of formal intervention orders.	Comd	PR	U
No evidence of knowledge of legal aspects of intervention.	Comd	PR	U
Sole decision indicates lack of overall experience with such high profile emergency operations.	Comd	PE	U
Failure to understand information received resulted in a failure to take the right actions through the right decisions-evaluation process.	Com	PE	U
Did not understand the importance of experienced salvors (and others)	Comd	PE	U
Did not understand the importance of ports/places of refuge.	Comd	PE	U
No knowledge of time and distance calculations.	Comd	PE	U
No knowledge of compass courses	Comd	PE	U
Did not appreciate the Master/crews' situation on board the stricken vessel.	Comd	PE	U
Only one option considered and retained throughout incident.	Cont	PE/PR/CU	U
Weather window not taken into account	Comd	PE/PR	U
No real place of refuge options considered.	Cont	PE/PR/CU/PO	U
Did not take advice from salvors in terms of options	Comd	PE/CU	U

Information passed to command about consequences of oil, but it was ignored.	Comd	PE/CU	U
Command failed to be inclusive and therefore failed to take into account other (experienced) views in option selection – in short, no options were considered other than taking the ship out to sea.	Comd	PR/CU	U
Only one course of action decided upon – this prevailed throughout.	Comd	PR/PE/CU	U
Failed to take into account any advice from others.	Comd	PE/CU	U
Those around command would not challenge any decisions	Comd	PR/CU/PE	U
Decision making was lacking – plenty of opportunity to make better decisions but failed to see them.	Comd	PE/PR	U
Decision making was being done at junior/subordinate level but not sufficient to change the course of the incident	Cont	PR/CU/O	U
Role of salvors ignored causing delay in actions	Cont	PR/PE/CU	U
Lack of understanding about what was happening at scene.	Comd	PE/PR	U
Antagonistic relationship with master from command led to unfortunate exchange of information (or lack of it).	Comd	PE/CU	U
Salvors delayed in taking action due to command insistence on approval letter.	Cont	PR/PE/CU	U
Failure to appreciate appropriateness of weather window.	Comd	PE	U
Focus on getting the master into custody rather than resolving situation	Comd	PR/CU/PO	U
Advice fed back to command ignored and caused delays in taking appropriate action	Cont	PR/PE/CU/PO	U
Did not readily evaluate any information to enable appropriate decision making.	Com	PR/PE	U
Seemingly unaware that initial and subsequent information appraisal is essential	Com	PR/PE	U
Seemingly unaware of NCP requirements under Decision Tree.	Comd	PR/PE/O	U
Technical advice not properly considered (wrong type of expert and failure to accept salvors' advice)	Comd	PR/PE/CU	U
No obvious understanding of the need for risk assessment and evaluation	Comd	PR/PE	U
The importance of contemporaneous and accurate notes of meetings and decisions *et al*. not understood or ignored	Com	PR/PE/CU/PO	U
NCP decision diagram requires options to be considered but Command did not.	Cont	PR/PE	U
Modelling of situation failed to appreciate all scenarios	Cord	PR/PE	U

MRCC had a better appreciation of scene than command function	Cord	PR/O	F
All relevant groups/committees formed	Cont	PR/O	F
Seemingly lack of understanding of other Plans (Biscay/Mancheplan).	Comd	PR	U
Unclear about the activation and use of NCP and sub-plans.	Comd	PR	U
No serious risk assessment conducted of any options – including places of refuge.	Comd	PR	U
Arrogance of command blocked any consideration of other people's views or view of options for resolution.	Comd	PE/CU	U
Modelling was ineffective in considering options as this was restricted to the pollution that had already happened rather than any 'what if' scenarios.	Cont	PR/PE	U
No place of refuge considered – even though this was requested by both salvors and master.	Comd	PR/PE/PO	U
Actions in relation to towing badly executed.	Cont	PE	U
Failure to appreciate the conditions on board and at the scene of the incident.	Comd	PR/PE	U
No complete understaning of resources available (tug confusion – contract *et al.)*	Cont	PR/RE/PE	U
Contract for government tug misunderstood.	Cont	PE/RE	U
Full appreciation of deteriorating situation not properly communicated to command – failure to assess situation. (Circumstantial)	Com	PR/PE	U
Feedback from scene and situation fragmented.	Com	PR/PE	U
Concentration of centres required	Cont	PR/O	U
No understanding of Local Authority process	Cont	PR/PO/O	U
Failure to appreciate situation on board vessel and thus limited communication availability.	Cont	PE/PR	U
Language issues prevailed from the outset but no solution considered	Com	PR/PE/O	U
Communications could have produced far better information to aid consideration of options, but failed to be used – fragmented focus of attention.	Com	PR/PE/O	U
No agreement on options being considered	Comd	PR/PE/O	U
Communications between command, ship and tugs plus salvors fragmented.	Com	PR/O	U
Actions requested of master and crew not clearly understood – failure to appreciate situation on board or on scene – exceeded realistic expectations	Com	PE/CU	U

Not a full understanding of what all resources were doing/had done, thus information inadequate to aid decision making (although this wouldn't have made any real difference).	Com	PR/RE/PE	U
Difficulty in understanding situation as it developed.	Com	PE	U
Information fed into command fragmented and thus fragmented information going out to resources	Com	PR/PE	U
No clear indication of coordination other than SAR.	Cord	PE/PR	U
Disjoint between Spanish and French and Portugal in understnading situation – failure of liaison resulted in limited access to appropriate infomation.	Cord	O/CU/PE/PR	U
Decisions communicated to resources were uncoordinated. Salvors having to wait before action taken.	Cord	PR/RE/PE	U
Information fed back from resources could have better aided by command.	Cont	PR/RE/PE	U
Results monitored on scene by individual resources but unclear whether this monitoring was collective.	Cont	PR/RE/PE	U

	Favourable (F) or 4.2 (U)	**People (PE)**	**Process (PR)**	**Resources (RE)**	**Organisation (O)**	**Political Influence (PO)**	**Cultural Influence (CU)**	**Totals**
Command	F							**0**
	U	30	17		2	4	12	**65**
Control	F		1		1			**2**
	U	13	16	4	4	3	6	**46**
Communications	F							**0**
	U	10	9	1	2	1	2	**25**
Co-ordination	F		1		1			**2**
	U	5	4	1	2		1	**13**
Totals		**58**	**48**	**6**	**12**	**8**	**21**	**153**

From my Key statements/Observations listed in Table 1 during this Case Study there are a far higher number of Command issues identified than any other component of the C4 framework (65 U), closely followed by Control (46 U – 2 F) and Communications (25 U) issues. Coordination

registers relatively few issues (13 U – 2 F) do not appear, in themselves to be a major problem. However, as with all the C4 framework components in the management of an MME numbers of issues do not indicate their complexity, particularly given their dynamics. The six categories within the components (more than one category can affect the outcome of an incident) show that People and Process appear more widely within my subjective assessment than any other category and together represent two thirds of the total issues. When comparing the components with the categories I interpret these outcomes as Command issues being influenced by People and Process; this is my experience and judgement from my public works and professional practice. It is people who fail to follow process, as in this case study; Command in this study, in my opinion, was influenced by political influence. I do not believe that the Commander was alone in influencing the decisions and outcome of the incident. The transcripts of conversations (identified in the case study) imply, in my experience, influence at a very high level. However, as I suspect much of this influence was 'behind the scenes' and not officially recorded I cannot readily identify many areas where this is evidenced, thus the low score (6). In contract to this, I consider that Culture played an important part in the outcome of this incident. As expressed in the body of the case study, the regime under which the commander was trained and practised was dictatorial and controlling which gave unquestioning status to those in charge. This is borne out also by the reluctance of junior personnel to challenge decisions made by senior officers and in particular the commander.

It may seem surprising that I have recorded the overwhelming majority of Favourable/Unfavourable scores to those in the Unfavourable category. However, given the internationally disastrous nature of the outcome to this incident; six countries polluted with a cost estimated in the region of $6bn it should not be considered surprising. The few Favourable aspects of this incident concern the SAR and MRCC actions which were exemplary; these aspects were carried out without the involvement of the commander or his team as they needed to be discharged immediately without such involvement.

4.4 Case Study #2: MSC *Napoli* – Text Book C4?

In contrast to the Prestige incident, the emergency involving the MSC *Napoli* followed an almost textbook C4framework protocol. On Thursday 18 January 2007 the container ship MSC *Napoli* sent out a distress signal after getting into difficulties in the English Channel. The 62,000-tonne vessel took in water through a hole in its side and the crew were forced to abandon ship.

Salvage efforts over the following few days didn't go to plan and the ship had to be beached off the East Devon coast. What followed was an extraordinary catalogue of events as her cargo (shipping containers) spilled onto local beaches around Branscombe, Devon, UK. At the time of the incident the emergency came under the command of the French Authorities.

In hurricane force winds the master of the *Napoli* mustered his 27 multi-national crew and successfully abandoned them into lifeboats where they were rescued by helicopters and boats (this in itself was a very successful local C4 framework implementation). The ship was in danger of splitting in two in the south west approaches to the English Channel and it seemed logical that the best course of action was to get her into the nearest suitable port, discharge the cargo and repair the ship. However, the wind and tide prevented the ship from turning and caused a split in the hull. In the UK a sole commander is appointed to take charge of such incidents. Unlike in Spain (and elsewhere), the commander in the UK uniquely has total command of any incident and does not defer to politicians. The mantra in the UK in terms of the MME commander (known as the Secretary of State's Representative or SOSREP) is 'back him or sack him'. These are the words used by Lord Donaldson (1997) in describing the role and responsibilities of the commander. So the SOSREP is free to make decisions in his own right. As a consequence the SOSREP agreed to take command of the emergency from the French Authorities – a most unusual if not unique move in itself. The rationale for this was based upon developing information about the incident. The *Napoli* was under tow by a French tug at this time and the SOSREP agreed that this should continue into British waters. It became clear that the state of the ship justified her being taken into a safe haven. However, the nearest port suitable to accept the ship was Southampton and it was doubtful that the *Napoli* could make it that far. In a most courageous and historic decision the SOSREP decided to beach the ship in a tourist resort, a place of special scientific interest, and an area of Jurassic cliffs and outstanding natural beauty (Figure 10). He knew the outrage that such a decision would cause but was clear that there was no other course of action if the English and French coasts were to be protected from oil pollution from the ship's bunkers and from the substantial spread of nearly 42,000 tonnes of container cargo around the English Channel with the ensuing threat to shipping. There were many objections to the decision by the SOSREP but he stood his ground and beached the vessel (Figure 10).

It later became clear to critics of the action that the decision taken by the UK SOSREP was in the best interests of all concerned and is now hailed as a text book C4 operation. Indeed locals even

named a beer after the *Napoli* in its honour – called 'on the rocks'. So what are the differences between the MT *Prestige* and the MSC *Napoli* incidents? Both Spain and the UK had contingency plans that contained reference to C4 procedures and both countries had a sole commander. It would seem it was in the application of C4 and the approach taken by the commander in each case that distinguished failure from success. A brief look at the backgrounds of the commanders in question shows the Spanish Director had many years' experience of the sea and of being in command. In contrast, the UK SOSREP's previous career had been as a trading standards officer, a stunt diver and a lifeboat mechanic. Are there clues here about the recruitment and selection of those who may find themselves in the position of overall command of a major maritime emergency?

Figure 10 - MSC Napoli beached off Branscombe, Devon, UK (source MCA)

In my view the recruitment and selection of those in command is an important feature in the success or otherwise of an emergency. It is just as important, if not more so, than adherence to the C4 framework itself or to the adherence of contingency plans or operational procedures.

In an exchange with the then UK Secretary of State's Representative (SOSREP), taking his views about the decisions made at the outset of the incident, he shared the following when asked about his 'gut feelings' and how they played a part in his decision making:

> *"NAPOLI's Mayday call was relayed to me within a few minutes of it being received by a CPSO. And from even the first basic information, something inside of me knew what was going to happen. As more information came in I instinctively knew that at some point, provided that she didn't sink, I was going to have to decide whether or not to accept the thing into UK Waters and that there was a good likelihood the she may sink*

or have to be beached. I reiterate that I knew this almost at the very outset of the incident and in most similar cases it was the same.

I guess the answer to your question is yes some sort of "gut feeling" is definitely behind the way I have done things in demanding situations. But as far as possible in these circumstances, I try to use reality as a measure of the probability that I am right. My experience is that, so far, my instinct has proved correct far more often than not."

My reason for asking the SOSREP about his gut feeling was to see if he believed that such a feeling was possible and if so how it played a part in the way he implemented the C4 framework. It is interesting that he says, "*some sort of gut feeling".* I have heard people refer to gut feelings a lot in my career but tend to think their feelings are the result of heuristic intuition based upon experience.

Once the *Napoli* was beached plans were made for its disposal. Meetings were set up that included a Salvage Control unit that comprise all essential personnel whom would have influence over the salvage operation; this was considered the main unit and she had several times a day by the commander. Fading into this group where the inputs from several other units, such as the environmental committee comprising representatives of all interested environmental groups – and including those usually a post two government actions such as Friends of the Earth and Greenpeace. Other groups included the shoreline and marine response units. The committees and groups set up covered all aspects of the incident and enabled views to be heard. The role of the commander was to consider all such views and to make timely decisions. Twice daily briefing notes were sent to senior officials and ministers to keep them up to date with developments. The briefings were timed to arrive prior to media announcements on progress. Without such regular briefings there is a tendency for ministers and senior officials to 'interfere' by taking up valuable time of those directly involved by asking questions. Communication discipline proved vital; this is an aspect of C4 that is often neglected allowing those external to the incident to become immersed in details that are of no direct concern to them and can create many problems for the commander that he could well do without at the time of complexity.

4.4.1 Identification of Key Statements/Observations

The C4 framework approach of the commander of the MSC *Napoli* incident, in my view, played a significant part in its success, in particular his ability to assimilate important information and to take on the views and opinions of others in identifying and selecting options for action. His approach was paramount in ensuring that the abilities and professional contributions made by all those involved was used to good effect. The 1st Duke of Marlborough, John Churchill (Burton, 2014) was considered a good general in many regards but none the least because of his ability to connect with his men regardless of rank or status. He is said to have taken a personal interest in their well-being even to the extent of ensuring that their boots were properly designed and made of good quality leather. This type of personality sets such a leader apart from those who tend to use their status or rank to command those for whom they have responsibility. In contrast to the commander of the MT *Prestige* incident, the commander of the *Napoli* listened, assimilated information and acted on advice but was his own man. The *Prestige* commander did not listen and refused to adjust his position regardless of the advice he was offered.

In a recent simulated military C2 study (Marusich, *et al.* 2016), about information availability on C2 decision making, the researchers concluded, *inter alia,* that "*increasing the amount of available task-relevant information is not necessarily beneficial to human decision-making performance,"*. The study covers a great deal more ground and offers a high level of academic treatment on the matter, but suffice it to say, that I believe the study supports my view from experience that it is essential for commanders to have the ability to filter decision-relevant information from the wealth of data that is offered and to have a clear situational awareness.

The salvage and related follow-up to the *Napoli* incident involved many complex operations over many months. The political and media interest was high and regularly focused on the command. It was essential therefore that the communications with all those involved remained solid; this included both written and verbal exchanges. Meeting notes were meticulous and briefing material accurate and there was no attempt to disguise the seriousness of the incident. Table 2 sets out a list of key statements/observations.

Table 2 - Key Statements/Observations MSC *Napoli*

Key Statement/Observation	Component: Command (Comd) Control (Cont); Communication (Com); Coordination (Cord)	Category: People (PE); Process (PR); Politics (PO); Resources (RE); Culture (CU); Organisation (O)	Favourable(F)/ Unfavourable(U)
The incident was well understood by those involved and it became clear that the situation was a major emergency that required major plans to be invoked	Com	PR/PE	F
Realisation that no ports of refuge available on French Coast	Cont	PR/PE	F
Best to head to a UK POR	Cont	PE/CU	F
Liaison with UK – realisation that best option was for UK to accept the ship into UK waters	Comd	PR/PE/CU/PO	F
UK took command	Comd	O/PE/CU/PO	F
Decision taken to use UK POR	Comd	PE/CU/PO	F
Decision taken to tow ship into UK waters	Comd	PE/CU/PO	F
All PORs considered and risk assessment made to arrive at optimum solution	Comd	PR/PE	F
All considerations taken into account and decision taken to beach in Lyme Bay	Cont	PR/PE/PO/CU	F
SAR decisions good but these seemed to fall outside of the scope of the overall command –well honed response.	Comd	PR/PE	F
Realisation that no ports of refuge available on French Coast	Cont	PE	F
Appropropriate links allowed proper receipt of alert (radio and beacon).	Com	PR	F
More than 40 organisations worked together to ensure a successful outcome	Cord	O/PR/CU	F
Initial information received quickly and gave pertinent facts.	Com	PR	F
Timely receipt of information by French Authorities and simultaneously received by UK	Com	PR	F
Ports of refuge were considered by French Authorities	Cont	PR/PO	F
Vessel towed to UK POR and beached in Lyme Bay	Cont	O/PR	F

Regular and frequent updates given to command and underpinning structure –actions revised in light of new information.	Com	PR/PE/O	F
Information was received by all resources in a timely manner	Com	PR/O/RE	F
It seems that all resources under the control of the command were able to assess information – judging by their actions	Cont	PR/RE	F
All resources were able to consider their options within the control exhibited by the command	Cont	PR	F
The resources had sufficient flexibility to decide on appropriate actions within their field of operations.	Cord	O	F
SAR actions good.	Comd	PE	F
No issues appeared to arise that prevented resources being controlled from taking appropriate timely actions	Cord	PR/RE	F
Resources being controlled were able to monitor the actions being taken and report back to their controlling authorities.	Com	O/RE/PR	F
Good exchange of information regardless of different language between master and MRCC	Com	PR/CU	F
Good radio/telephone communications	Com	PR/O	F
Lot of detail given and questions asked	Com	PR/PE	F
No delay in receipt of alert	Com	PR/O	F
Information clearly understood	Com	PE/CU/PR	F
Clear understanding between all involved what options were under consideration	Com	PE/CU/PR	F
Actions clearly communicated to all involved	Com	PR/O	F
Actions clearly understood	Com	PE/O	F
Communications (radio) between resources on scene appeared appropriate.	Com	PR/RE	F
Regular reports fed back into command structure and various committees/groups	Com	PR/PO	F
SITREPs regularly and frequently despatched internationally in a timely fashion	Com	PR/CU/PO	F

Information about coordination on scene and of the actions being taken appeared good	Cord	PR/RE	F
Information about the coordination of the incident was assessed and was used to good effect	Com	PR/R	F
A wide range of options for the successful coordination of the incident were considered.	Comd	PR/PE	F
Actions concerning the coordination of the incident were taken in a timely fashion and proved to be effective.	Cord	PE/RE	F
Coordinated actions were taken at the right time and in the right place.	Cord	PE/RE/PR	F
All coordinated actions were reported back to the command and controlling authorities.	Cord	PR/O/PO	F

	Favourable (F) or Unfavourable (U)	**People (PE)**	**Process (PR)**	**Resources (RE)**	**Organisation (O)**	**Political Influence (PO)**	**Cultural Influence (CU)**	**Totals**
Command	F	7	4	0	1	4	4	**20**
	U							
Control	F	4	6	1	1	2	2	**16**
	U							
Communications	F	6	18	4	7	2	1	**38**
	U							
Co-ordination	F	2	4	4	3	2	1	**16**
	U							
Totals		**19**	**32**	**9**	**12**	**10**	**8**	**90**

In analysing the key statements/observations from the *Napoli* it is clear that I consider them all to be Favourable (F). This is not surprising as I consider the implementation of the C4 framework to be an exemplar of good practice and in complete contrast to Case Study #1, Prestige. However, as with Case Study #1 it is the people and process issues that stand out. The

remaining categories are similar in numbers and notably organisation is prominent amongst these. My interpretation of this Case Study is that the solid organisation that was in place laid the foundations for the implementation of the C4 framework and allowed processes to flow and the people involved to do their jobs. Significantly, the majority of the F issues fall within the Communications component of the framework and are linked to the people and process categories of the C4 framework. My judgement as expressed within the key statements/observations is that overall the C4 framework was implementation effectively and efficiently. Case Study #1 took place within an internationally recognised organisation as was Case Study #1, but was not allowed to function as it should due to the autonomous approach adopted by the Spanish commander. In essence the commander was a single point of failure.

Also in contrast to Case Study #1 is the way the political and cultural issues were handled. In Case Study #1 I am certain that political interference behind the scenes (although there is no direct evidence of this) influenced the commander's actions. This influence was easy to apply given the cultural background of the commander. In Case Study #2 the commander was allowed complete freedom to operate autonomously and the confidence in him by politicians had been built up over five years. The Spanish commander in Case Study #2 had not had the sort of exposure to MMEs that the UK commander had and I believe the behaviours exhibited by him were a result of this limited exposure and lack of confidence. There are many examples of the Spanish commander not actually understanding even the simplest concepts of the C4 framework and the management of an MME. As the direct interface between the commander (SOSREP) and politicians to leave him free to get on with the job, I ensured that ministers and senior officials were kept regularly and frequently briefed about what was happening; *'No surprises'* was the approach adopted. If a minister or senior official feels isolated and unable to demonstrate to others that he/she is on top of their brief, or even worse if others tell them what is happening or the media make unfortunately announcements, Ministers and others will interfere. It is therefore vital that the communications links are always open from the commander and his/her team to politicians through a senior official with timely briefings.

In this Case Study (#2) cultural divides between France and the UK were dealt with again through many liaison visits over many years. Although the Spanish had similar arrangements with the French these did not appear to be working effectively during the Prestige and this may have been a reflection of internal cultural issues. And the arrogant stance adopted by the Spanish commander.

4.5 Case Study #3: MS *al-Salam Boccaccio 98* – Lack of a C4 Framework

In December 2007, together with the former UK SOSREP, I was invited by the International Maritime Organisation (IMO) to carry out a brief investigation into the loss of the Egyptian ferry *al-Salam Boccaccio 98* in the Red Sea in February 2006, and to draft a national contingency plan for maritime emergencies. I mentioned earlier in this study that I consider the term *Contingency Plan* to be somewhat of a misnomer and prefer *National Emergency Arrangements* to imply that the document comprises the roles and responsibilities and links between those involved together with the available resources rather that how different scenarios should be *planned* to act in specific circumstances. Therefore the approach I adopted to the Egyptian situation were arrangements and not plans; however, getting all those involved to agree their roles and responsibilities and links between them was almost impossible and in itself gives a good indication why the MME resulted in many C4 framework failures.

The MS *al-Salam Boccaccio 98* went down almost mid-way between Saudi Arabia and Egypt (but closer to Egypt and within Egypt's search and rescue region) with the tragic loss of 1015 lives. The ferry had left its port in Saudi Arabia reportedly with a small fire in the engine room and overloaded with passengers. Pilgrims and weekday workers were returning to Egypt for the weekend and were anxious to get away. The pressure on the ferry operators resulted in them leaving port with a view to fighting the fire on the way. Ludicrous as this may now seem, at the time it clearly appeared to the master to be a good decision at the time. Unfortunately, as the crew fought the fire, the action released a high volume of water and the ferry suffered the Titanic 'free surface effect' with surface water washing around the open car decks causing the ship to become unstable and capsize; the soap dish in the bath principle. The ferry was an old design and not subject to compartmentalisation under the Stockholm Agreement (2003) which applies to European ships only. The ferry was sold out of Europe in the late 1990's to Egypt. As an aside, this incident demonstrates that when SOLAS came into being in 1914 following the Titanic tragedy it tended only to address large passenger ships in terms of design and did not cover future designs such as roll-on/roll-off ferries.

The ship lost contact with the shore at around 2200 GMT on 2 February 2006 and an alert was received (via a satellite distress beacon) at RAF Kinloss in Scotland at 2358 GMT. The alert was passed via France to the Egyptian Authorities (MRCC Cairo). It is said that it took some 14 hours before a search and rescue mission was mounted. Command was uncertain, resulting in a lack

of co-ordination at the scene and disjointed communication. Moreover, the control of resources was hit and miss, for example, the Israeli Navy offered assistance but was turned down. The USA offered a maritime patrol aircraft which was initially turned down then accepted. A C4 framework did not exist in any useful form to marshal the response to the MME.

My involvement in 2007 with the Egyptian Authorities culminated in a draft National Contingency (Emergency) Plan (Arrangements) for Egypt which was translated into Arabic before I left Egypt but sadly, and no doubt not helped by the Arab Spring, has not been enacted. The *Plan* required the agreement of more than a dozen disparate government departments (it was suggested that in fact it may have been as many as 25) each of which apportioned blame for the tragedy to each other. At the outset of the work I carried out several presentations which were made to the assembled Egyptian authorities and before I was able to make my first presentation I was stopped in my tracks and told that it would not be acceptable to name the stricken ferry because it highlighted a failure. From that point on I had simply to refer to the *al Salam Boccaccio 98* as the 'vessel' or 'ferry' or the 'ship'. I found this quite remarkable but on reflection it was a clear indication at that stage than it would be unlikely to reach a satisfactory conclusion on the way forward and it is perhaps no surprise that the arrangement I derived have never been published.

The disparate nature of the Egyptian maritime emergency response system with its very many stakeholders produced confusion and a lack of co-ordination between them, and resulted in them being unable to acknowledge the failures by relevant government departments which further demonstrated to me the lack of any real commitment to resolving future emergency situations. In his paper dealing with disaster management in Egypt, Abulnour (2013) discusses the *al Salam* incident among others and says,

> *"As a scientific discipline and specialisation, the concept of disaster management is highly undeveloped in Egypt. According to the official website of the Egyptian Institute of National Planning (http:/www.inplaning.gov.e.g.l), there are no tuition or training courses in the field."*

I agree with Abulnour in this regard. However, Abulnour considers that Egypt is more versed in dealing with disasters after they happen. This may be true when it comes to land based incidents but I do not consider that Egypt is able to deal with major maritime emergencies

either when they occur or afterwards. However, to be fair to Abulnour, he is primarily focused on disaster management in the round.

Egypt could learn some important organisational lessons from other countries, for example, the US or the UK and Europe in general. However, Egypt does not see the response to major maritime emergencies as a priority given its current political situation. I was once told by a South African army colonel on a fact finding visit to the UK that his country had a budget of $15k for the entire SAR organisation and that it was likely that the UK through its international Coastguard RCC in Falmouth would likely continue for the foreseeable future to be alerted to distress cases off the coasts of South Africa. He suggested that whilst life was a cheap commodity in South Africa little money or attention was going to be paid to a handful of people on a yacht or a small ship. The situation in South Africa has greatly improved over the years but sadly this is still not the case in many areas of the world.

4.5.1 Identification of Key Statements/Observations

It was clear that no cohesion existed between all those concerned with the handling of major maritime emergencies -indeed any emergency. This lack of cohesion existed in normal everyday activity and bled across to a significant C4 framework failure. There were too many disparate organisations involved and responsibilities were divided and unclear. The failure of communication between those involved during the incident resulted in confusion because vital information in some cases reached a *cul-de sac*. In short no coherent maritime emergency management system or recognisable C4 framework existed.

My attempt to provide a structure for future emergency response through a NCP failed due to political constraints and the Egyptian director who generated the initiative through the IMO was left very disappointed. It is ironic that Egypt has a first class Academy of Science and Technology and Maritime Transport in Alexandria that boasts some of the most modern equipment for handling emergencies I have ever seen but sadly it is used for academic studies for students outside of Egypt nor for real-life scenario training.

The organization for the management of MME in Egypt lacks cohesion and key relationships between the components of the C4 framework and is a clear example of organisation failure leading to a substantial loss of life; I am not suggesting that the organisation failure resulted in the entire loss of life but that many lives in my opinion could have been saved by prompter and

more timely action. There are obvious lessons from this Case Study to take forward to other IMO Member States but it is clear to me that the political environment has to be stable and willing to adopt fundamental change. The relationships between all parties involved in the emergency response organisation in Egypt are fraught with immense difficulties. The compartmentalized nature of principle government departments and the lack of ability or willingness to accept responsibility for change will inhibit any real improvement to the emergency response organisation; the pieces of the jigsaw are available but remain in different boxes. I cannot find any aspect of the C4 framework in this Case Study that I find favourable. Moreover, it was difficult, given the restrictions on available information, to analysis properly all the unfavourable aspects.

Table 3 lists the unfavourable actions/inactions of the Egyptian C4 framework.

Table 3 - MS al Salam Boccaccio Key Statements/Observations

Key Statement/Observation	**Component: Command (Comd) Control (Cont); Communication (Com); Coordination (Cord)**	**Category: People (PE); Process (PR); Politics (PO); Resources (RE); Culture (CU); Organisation (O)**	**Favourable(F)/ Unfavourable(U)**
Alert received by another country's receiving system	Comm	O/PR	U
Alert passed via France and eventually to Cairo creating 14 delay	Comm	O/PR/PO/CU	U
Uncertain Command structure	Comd	O/PR	U
Control of resources was hit and miss	Cont	O/RE/PR	U
Offer of resources repeatedly turned down by Command	Comd	PE/RE/CU/PO	U
Lack of operational structure	Comd	O/PR/CU/PO	U
No National Contingency Plan	Comd	PR/CU/PO	U
Disparate government departments failing to agree	Comd	O/PO/CU	U
Government departments in denial about failure	Comd	PE/PO/CU	U
Maritime emergency response system had too many disparate stakeholders	Comd	O/PE/RE/CU/PO/ PR	U
Lack of commitment by government	Comd	O/PO/CU	U

Unable to acknowledge failure	Comd	PE/CU/PO	U
Concept of disaster management highly undeveoped	Comd	O/PR/RE/CU/PO/ PE	U
No tuition or training courses	Comd	PR/O	U
More able to deal with disasters after they occur and not plan ahead	Comd	O/PR/CU/PO	U
No effective communication links between vital bodies and resources	Comm	O/PR/CU/PO	U

	Favourable (F) or Unfavourable (U)	People (PE)	Process (PR)	Resources (RE)	Organisation (O)	Political Influence (PO)	Cultural Influence (CU)	Totals
Command	F							
	U	5	7	2	7	9	9	**39**
Control	F							
	U		1	1	1			**3**
Communications	F							
	U		3		3	2	2	**10**
Co-ordination	F							
	U							
Totals		**5**	**11**	**3**	**11**	**11**	**11**	**52**

It is difficult to draw any conclusions from Table 3 as the information offered by the Egyptian authorities was sparse and all that was available to the review of that actions in the Case Study was what had been written about the emergency and mostly through the media. However, that in itself indicates the political and cultural influences over the Case Study. Compared to Case Studies #1 and #2 political and cultural influences are high and result, in my judgement, in poor organisation and processes. No formal report from the Egyptian authorities has been written on this Case Study and I think it unlikely that one will be produced. In essence, I established there was a failure in command through a lack of any organisation to host a C4 framework.

Perhaps a favourable outcome of the incident, which cannot actually feature as a C4 framework issue, is that the Egyptian authorities at least recognised that they did not handle the MME well and sought IMO involvement. This is to their credit but from my involvement with the authorities it seemed that this was brought about by only one, maybe two, concerned individuals and cannot strictly be called 'recognition by the authorities'.

Clearly without a recognisable and well-structured organisation in which to host a C4 framework the framework cannot itself effectively function, if at all. This Case Study is an example of an IMO member state paying lip service to the resolutions and regulations of the IMO but failing to interpret them properly. There were no effective communication links between the authorities and resources involved and hence no effective coordination; this latter aspect is difficult to gauge as there is no evidence one way or the other. Whether or not there were any cultural issues at play during this incident is difficult to say but I suspect, as evidenced from the aftermath that internal cultural differences prevailed and prevented agreement and this continues to the time of this study.

4.6 Case study #4 Multitank Ascania

On 19 March 1999 the Tuvalu registered chemical tanker Multitank Ascania was carrying its cargo of 1750 tonnes of vinyl acetate from Eastham on the Manchester Ship Canal to Teesport through the Pentland Firth in Scotland. A fire broke out in the ship's boiler room and a distress call went out in the small hours of the morning. The Coastguard received the call and took SAR action. The master of the ship stopped engines and used the vessel's carbon dioxide drenching system in an attempt to put the fire out. It was uncertain, once all the CO_2 had been used that the fire had been extinguished because the boiler room had been sealed.

All possible actions were taken by the coastguard to resolve the situation; crew were evacuated by lifeboat and helicopter (the master remained on board for some time) and fire-fighting arrangements were made together with a tug to tow the ship away from the shore. Unfortunately the tow line broke leaving the ship held by a single anchor a half mile from the nearest point of land. Due to the explosive nature of the situation exclusion zones were placed around and above the ship and the population along the coast was evacuated a safe distance inland.

Lord Donaldson's Review of Salvage and Intervention and their Command and Control (1999) accompanied by the government's interim response were issued on 15 March four days before the incident. At that time no discussion had taken place about the impact of the report and the major emergency concept of operations. I decided that as the government's response to Donaldson was positive I would assume the new role as SOSREP and act accordingly. This proved operationally beneficial as the processes involved with intervention orders and the powers under the Merchant Shipping Act 1974 (as amended) gained new impetus.

I have mentioned earlier in this study the involvement of government officials and in particular the Secretary of State. Although I had taken on the role as SOSREP, the one person who chose to ignore my powers was the Secretary of State himself. At the time elections were taking place in Scotland and the Secretary of State for Transport was also the Secretary of State for Scotland. This may perhaps explain the keen interest he had in the outcome of the incident. By March 20th the weather had improved and the Minister, Salvage Master, Chief Fire Officer together with MCA representatives and Chemical Strike Team plus a press officer flew over the vessel. A thermal imaging camera detected hot spots on the ship and it was decided that the only way to check if the fire was out would be to send the Chemical Strike Team on board. This was done and there was general agreement that the ship was safe to tow into a safe have; in this case Scapa Flow in the Orkney Harbour jurisdiction.

The incident C4 was fragmented for the Ascania emergency in that local C4 was carried out from the MRCC in Pentland and to some extent on scene. As SOSREP I remained in the Major Emergency Operations Room (MEOR) in Southampton and was regularly briefed about progress and consulted on major decisions. Communications were established with all key bodies and resources throughout the emergency. The most significant decision I made was to take the ship into Scapa Flow into a safe haven. Understandably, the Orkney Harbour Master and his Trustees, in whose area Scapa Flow resides, were not keen to allow a potentially explosive ship into their jurisdiction. I was invited to give a guarantee in writing that the ship would not explode before it was agreed that the ship could enter. Although a courtesy arrangement to give legal force to the situation I issued an Intervention Order as a direction on the Harbour Master to accept the ship; this brought with it a government indemnity without the need for a separate written guarantee but as intervention orders of this type were relatively new and untried it satisfied the Orkney authorities and smoothed the passage of the ship to safety.

It was clear during the incident there was a need to conduct briefings of essential personnel outside of the MEOR to allow information to be assessed without interruption from the general melee of the operations room environment. It was also fortuitous that a major chemical exercise was held a few days before the incident which included chemical strike teams. It became evident that proforma covering intervention orders, exclusion zones and temporary danger areas needed to be prepared in advance and cleared with legal officers to avoid unnecessary delays during incidents. In terms of resources, the merger of the Coastguard Agency and the Marine Safety Agency into the MCA the previous year enabled the easy use of surveyor and naval architect expertise without going through hitherto formal bureaucracy.

Under the new SOSREP arrangements regular briefings were passed to ministers and officials to avoid making frequent enquiries and disrupting operational staff.

4.6.1 Identification of Key statements/Observations

Table 4 lists the key statements/observations I have made from the *Multitank Ascania* Case Study.

Table 4 - Key Statements/Observations *Multitank Ascania*

Key Statement/Observation	Component: Command (Comd) Control (Cont); Communication (Com); Coordination (Cord)	Category: People (PE); Process (PR); Politics (PO); Resources (RE); Culture (CU); Organisation (O)	Favourable(F)/ Unfavourable(U)
All possible actions taken by the Coastguard	Comd	PE/PR/RE/O	F
Actions taken in line with Government Guidance and from Lessons Learned during previous incidents	Comd	PE/PR/PO/O	F
Detrimental involvement of government ministers	Cont	PO	U
Consideration of multi-options for action	Comd	PE/PR	F
Commander separated from principle local command centre	Comd	PE/PR	U
Positive use of intervention orders	Comd	PE/PR/PO	F
Regular briefings to and from local command centre to Commander and onwards to ministers and officials	Comm	PR	F

	Favourable (F) or Unfavourable (U)	People (PE)	Process (PR)	Resources (RE)	Organisation (O)	Political Influence (PO)	Cultural Influence (CU)	Totals
Command	F	4	4	1	2	1		**12**
	U	1	1			1		**3**
Control	F					1		**1**
	U							
Communications	F		1					**1**
	U							
Co-ordination	F							
	U							
Totals		**5**	**6**	**1**	**2**	**3**	**0**	**17**

Although the incident was considered an overall success in that the fire on board the vessel was extinguished and she was taken into harbour for repair, certain aspects of the C4 framework could have failed. In particular, the remoteness of command from the location where all the local action was taking place could have caused problems had it not been for the communications protocols that were in place. Indeed, I personally felt uncomfortable with my remoteness from the local command. In Case Study #1 the remoteness of the commander from the local focus did cause a breakdown in communication and a somewhat fragmented command. It would have been possible for me to leave a small briefing team in Southampton at the MEOR and place myself in the local command centre but I chose not to. In hindsight this was a mistake that could have caused an unfavourable outcome. However, as I have discussed at the outset of this study, the implementation of the C4 framework relies heavily on the people involved. In this case I was fortunate that the team involved at the remote location and the team in Southampton at the MEOR interacted well, principally because they had worked together before on many occasions and acted as though they were in the same geographical location.

I have discussed the involvement of a government minister in this emergency and is could have resulted in an unfavourable outcome particularly with local emergency service resources. Regardless of the effort made to remove the minister from the scene they proved fruitless. The strength of character and status of the minister proved a difficult person to handle. Even a senior adviser quit his post and returned to London at the difficulties encountered with the minister. I do not offer a solution to this dilemma as it has never happened since in my experience or knowledge. I recall Donaldson's (1997) words of *"back him or sack him"* and cannot understand why a minister would place himself in the firing line for criticism if the incident culminated in disaster. On the other hand if such disaster prevailed and he was remote from the scene blame would have mostly been attached to me.

4.7 Case Study #5: Development of Resources - Marine Incident Group (MIRG)

Following an approach to the Secretary of State for Transport I gained his approval to launch a new initiative to formalise the UK ship fire-fighting response. This resulted in the *Sea of Change* project (UK Parliament website, 2015) and the ultimate establishment in 2005 of the Marine Incident Response Group (MIRG). This comprised 15 strategically located fire teams around the UK comprising a minimum of 50 fully trained and equipped fire fighters able to be transported by helicopter or boat to fires on board ships within the UK SAR Region (UKSRR).[11] The principle here is that if resources do not exist to deal with maritime emergencies that are within the control of the commander then there is no excuse for not attempting to create your own. Basically in the case of fire-fighting at sea the control component could be said to be missing from the C4 framework as there were no resources available to manage. I have used this principle of intervention often throughout my career. It is sometimes necessary to make an organisation fit for purpose by introducing resources outside of the main organisational body. I expand on this point in the next section and will explore this further in this study.

In 2011 the UK Government in a written statement to Parliament announced that the MIRG arrangements that had been in place since 2006 would cease and replaced by advice on firefighting to ships at sea would be carried out by salvors under contract. The announcement followed consultation with UK Fires Services and a short review that concluded that the most valued aspect of the MIRG was advice rather than action at sea. Needless to say this

[11] UK SRR comprises an Area of some 1.25 Million square sea miles and stretches across the North Sea and English Channel to Anglo-foreign median lines and up to 1000 nautical miles west into the Atlantic Ocean.

announcement did not meet universal approval and was criticised for being a cost-cutting exercise as it followed the Government's 2010 Spending Review. Up until its demise the MIRG was funded by the Department for Transport, including the establishment of fire officers within the MCA. The option was available for the UK Fire Services to pay for the MIRG but this was not taken up probably due to financial constraints.

It is interesting to note that the UK's Emergency Towing Vessels (ETVs) that had been in place in one form or another since 1994 around the UK coast was also a victim of the same spending review. As a consequence the provision of ETVs now rests with ship owners following an emergency at sea under contracted salvage arrangements. This arrangement misses the point that ETVs were, as their title indicates, emergency response resources whereas tugs for emergency operations can take a substantial amount of time to be contracted to an emergency.

A basic cost benefit analysis of the ETV value was carried out by a member of the UK's counter pollution team (unfortunately I can only recall from memory as no documents exist) which ETV costs of £10 million. I understand the figures are based upon the value of the ships and cargoes that were saved by timely action together with insurance life costs.

The resource infrastructure within an MME response organisation is an important feature in ensuring a successful outcome and cannot in my view be overstated. Having resources to hand when they are most needed can often be vital in saving lives and protecting property and the environment. Delays in procuring resources can not only be frustrating but can create unnecessary time delays and can ultimately cost a country many millions of dollars. During my time as the UK Director of Maritime Operations I introduced framework agreements with contractors that could provide resources during major emergencies. The agreements included basic equipment provision, timescales and basic prices and avoided the need for protracted negotiations when time was of the essence. The framework initiative followed on the legal cases involving the Sea Empress incident (1996). The UK made claims totally circa £12 million for the resources employed during the incident but only received around £7 million. The remaining £5 million was thrown out as unnecessary expenditure. Having received the many expenses involved I can quite understand why the insurers refused to pay many of them. Clearly there was a lack of structure to the use of resources and many were called forward on day rates just in case they were needed and many were not. There is a tendency during a major incident that is well publicized to attract a great many 'resource providers' that find themselves on an

organisation's resource list by some means or another. The framework agreements prevented this happening in the future as the resource provision lists were agreed with insurers in advance. There was of course some flexibility in the agreements to allow for unanticipated resources. Having an anticipated resource provision in place ahead of any emergency has proved very beneficial. Unfortunately the provision of ETVs now in the hands of shipping companies affected by an emergency can result in unnecessary delays in provision but the UK MCA has made some inroads into making arrangements with shipowners to reduce contract delays. During the Prestige incident the Spanish Authorities were confused about the contracts they had in place for tugs and on one occasion committed a tug that was in dry dock to assist the stricken vessel. Keeping resource data up to date is vital.

4.7.1 Identification of Key Statements/Observations

Table 5 lists the favourable/unfavourable key statements/observations linked to the MIRG.

Table 5 - MIRG Key Statements/Observations

Key Statement/Observation	Component: Command (Comd) Control (Cont); Communication (Com); Coordination (Cord)	Category: People (PE); Process (PR); Politics (PO); Resources (RE); Culture (CU); Organisation (O)	Favourable(F)/ Unfavourable(U)
National firefighting response set up in response to need	Cont	O/PO	F
Significant resource enhancement to the national maritime emergency response structure	Cont	RE/O	F
Resources within command and not under another organisation's control	Cont	RE/O	F
Filling an operational gap within the C4 framework	Cont	O/PR/RE	F
Switched dedicated resources to external organisation due to cost	Cont	O/RE/PO	U
Overall reduction in maritime emergency response resources due to spending review by government	Cont	O/RE	U
Provision of Framework Agreements can reduce delays in resource provision	Cont	O/RE	F

	Favourable (F) or Unfavourable (U)	People (PE)	Process (PR)	Resources (RE)	Organisation (O)	Political Influence (PO)	Cultural Influence (CU)	Totals
Command	F							
	U							
Control	F		1	4	5	1		**11**
	U			2	2	1		**5**
Communications	F							
	U							
Co-ordination	F							
	U							
Totals			**1**	**6**	**7**	**2**		**16**

The introduction of the MIRG enhanced the C4 framework organisation and in particular it brought emergency resources within the control of the MME commander. Table 5 indicates that control benefited from the MIRG introduction and when it was removed this introduced a resource gap in the organisation and removed control of an important resource from the commander. The gap in the C4 framework process filled by the MIRG provided a more efficient and robust response to an MME. Prior to the MIRG firefighting at sea relied on the goodwill of fire services around the coast and informal agreements with chief fire officers. Chief Officers were reluctant to engage in some cases as the firefighting at sea role was not included within the Fire Services Act and as such was not financed. As a consequence gaps appeared in the coastal structure and fire teams now have to be called from only a hand full of trained and available fire fighters.

I have discussed earlier in this study the need to have MME resources within the control of the MME commander; the MIRG filled an important gap which has now reappeared and damaged in my view the C4 framework organisation.

4.8 Case Study #6: Making an Organisation Fit for Purpose - Review of HM Coastguard

With further regard to command and the recruitment and selection of suitable commanders, I believe the structure of an organisation has to be appropriate to the development of the right people with the right skills. It is not my intention to suggest ways in which these aspects can be improved as it is outside of my competence but I will suggest what, in my view, can be improved.

In 1996 I was tasked to carry out a wide-ranging review of Her Majesty's Coastguard (HMCG) from top to bottom. Reviews had of course been carried out before but this review was different. First of all we were to interview almost all of the regular uniformed staff (those in operations centres and those controlling HMCG coastal resources (around 1000 including volunteers) and as many Coastguard Auxiliaries as possible (circa 4000). The terms of reference for the review included operational organisation and grade structure together with numbers of staff. In the event the review team interviewed over 90 of regular staff and around 50% of auxiliary coastal personnel. The team also interviewed bodies associated with the Coastguard Service such as the Ministry of Defence, RNLI, Royal Yachting Association (RYA) and the Chamber of Shipping.

The results of the interviews together with quantitative data about operational activity allowed the team to put together a Five Year Strategy for HM Coastguard, (Astbury, 1997). Prior to the review, as Chief Operations Officer for HM Coastguard, I noticed that the decisions being made by those responsible for dealing with what I would call, bread and butter maritime emergencies (windsurfers, swimmers, small boat incidents) were lacking with regard to basic C4. Incident reports called CG15 together with comments about the incident where the response had in some way failed (components of the C4 framework) procedurally crossed my desk. My managers thought this was because of those in charge being too junior. During the review the relationship between incident failure and the grade level of the officer in charge was examined. It was found that many of the officers in charge of routine operations were not in fact making decisions and were not actually in command of the incident at all but were passing decisions to their duty senior officers who were remote from the operations centre (in their offices or at home and sometimes in bed) and had no real feel for the emergency at hand. The junior officer in the operations centre did not feel able to take the necessary decision. The review was able to

make suitable recommendations to change the operational structure – basically the answer was to put a more senior officer on watch. As a result decision failures reduced.

Whilst the review improved the rank level of commanders it did nothing to affect the recruitment and selection process nor did it say anything about experience and competence levels before individuals could be promoted into higher grades and greater responsibilities; in this regard the review failed and was more focused on the efficiency in terms of numbers of coordination centres, staff complements and their grades rather than the competency level those who staff them. It is one thing to introduce higher grade officers into coordination centres but quite another for them to be the right people in all respects. The review focused on putting the right number of people in the right place at the right time when it also ought to have been focused on the right **sort** of people in the right place at the right time. As the author of the review report I can say that it was successful in reducing coordination centres and recommending appropriate complements at peak, medium and lower activity times. Give or take the same number of staff prevailed overall due to political constraints – the Secretary of State for Transport would not agree to the staff reductions in Scotland resulting in coordination centres north of the border being over complemented. The anticipated reduction in costs was marginal and only a fraction of what was expected – around £50k compared with some £3M-£4M. This review also resulted in promotions across the board for many officers, particularly those with time served and those managing coastal resources, without any competency examination. In short, the review as it stood was in my view sound but following its publication its effect was seriously reduced.

Van der Mer *et al*. (2004) carried out a data envelopment analysis (DEA) on the performance of Coastguard Centres to test the validity of the review's closure programme. As the organisational structure of the Coastguard Service is relevant to the implementation of the C4 framework it is worth discussing the approach used in the DEA. Van der Mere *et al.* (2004) in their quantitative analysis used both binary logistic regression (BLR) and stochastic frontier analysis (SFA), and concluded that both Donaldson (1999), who carried out a review of the Coastguard 5-year Strategy, and the five-year review recommendations were flawed in so much as the length of coastline required to be covered by each centre and the corresponding level of local knowledge needed by centre staff. Further work along these lines was carried out by Norrington *et al*. (2008) in which the authors modelled the reliability of the C4 implementation, in particular the response to emergencies, with Bayesian belief networks (BBN); in contrast to the DEA the BBN

was a largely qualitative analysis. The two sets of conclusions were much the same. However, both these analysis were in themselves flawed as they failed to take account of the local knowledge provided by sector managers and their rescue teams and the coordination role they play. Both approaches clearly misunderstood the role of the Coastguard command centres. Therefore, the length of coastline assigned to each coordination centre as a variable was, in my view, particularly erroneous as it is irrelevant given the sophisticate communications network available to command centres and their ability to handle minor emergencies and MMEs. The assumption by Van der Mer *et al.* (2004) and Norrington *et al*. (2008) was that all coordination took place from coordination centres and that local knowledge of the coastlines under their remit was invested solely in the coordination centre staff. This is not the case. Moreover, the two analyses were carried out using basic assumptions concerning coordination centre activities and on the incident data alone. The review I undertook involved over nine months of visits to all coordination (command) centres and extensive semi-formal interviews with all regular staff and nearly one third of coastal response team personnel (around 1500). A detailed analysis was undertaken of activity levels and their diurnal shift, the number of staff involved together with the duration of incidents. It would seem that the studies carried out by Van der Mer *et al.* (2004) and Norrington *et al*. (2008) did not have access to the three volumes of analysis conducted by the review team as these were never published. Nevertheless, the approach adopted for the two analyses, one quantitative and the other qualitative, provides useful information for the approach being adopted in this study; the analysis and extraction of key statements and observations from the case study data being qualitative and the survey results being quantitative.

More recently in December 2010 the Maritime and Coastguard Agency (MCA) published a consultation document, *'Protecting our Seas and Shores in the 21st Century: Consultation on proposals for modernising the Coastguard'* (MCA, 2010)*'.* Similar to the Review I undertook in 1996, the 2010 review was designed to "*enable fewer Coastguard centres to monitor and communicate with ships anywhere around the UK coastline, as well as delivering complete integration* between *stations".* The basis for this review was the much improved communications technology now available. As with other reviews before it, critics focused on local knowledge and the ability of 'remote' centres being able to handle 'remote' incidents. Again, critics failed to recognise the essential contribution to coordination of coastal resources as sources of incident intelligence and information directly from the scene into the coordination

centre. It is interesting to note the comments of the Government in response to the Transport Committee's critical comments about the 1999 review and associated closures:

'Although the co-ordination centres are an integral part of the SAR chain, it is important to distinguish between the role of Coastguard Rescue Co-ordination Centres on the one hand, and the role of those who undertake search and rescue missions on the other (the local auxiliary coastguard teams, helicopter and lifeboat crews). Rescue resources are not located at the centres but are dispatched from strategic locations on instructions issued remotely from co-ordination centres. There has been no reduction in the actual number of response teams carrying out search and rescue'. This statement makes it absolutely clear that local knowledge is not the sole domain of the coordination centre and its personnel. Unfortunately this misunderstanding continues to this day, coupled with the belief that 'Rescue' coordination centres actually carry out the rescues. Their role is one of implementing the C4 framework and not physically carrying out rescues.

This most recent review led to a revision of the competency profiles of coastguard operations room staff together with a much improved recruitment cycle involving assessment days for the coastguard selection process using the ORCE approach (Observe, Record, Classify and Evaluate) (Edenborough, 2005 and Gautier, 2015). The approach adopted to recruitment and selection for Coastguard grades is a huge step toward ensuring that the right type of people are aligned with the right jobs. However, the profiles sought appear to be aligned with general abilities: Seeing the Big Picture; Making Effective Decisions; Leading and Communicating; Building Capability for all; and Managing a Quality Service. These are commendable assessment competencies but they still do not appear to cover operational characteristics appropriate to potential MME decision making.

4.8.1 Identification of Key Statements/Observations

Table 6 sets out the key statements/observations concerning the Review of HM Coastguard – C4 framework capability and Preparation for the management of MME.

Table 6 - Review of HM Coastguard Key Statements/Observations

Key Statement/Observation	**Component: Command (Comd) Control (Cont); Communication (Com); Coordination (Cord)**	**Category: People (PE); Process (PR); Politics (PO); Resources (RE); Culture (CU); Organisation (O)**	**Favourable(F)/ Unfavourable(U)**
Review of organisation carried out including external interested bodies	Cont	O/PR	F
Review developed into a 5-year operational strategy for maritime emergency response	Cont	O/RE	F
Rank/Grade of commander questioned and considered too junior	Comd	PE/PR	U
Need for commander to be in operations centre and not remote	Comm	PE/PR	U
Commander did not feel able to make decisions	Comd	PE/PR	U
Introduction of new communications technology	Comm	PR/O	F
Rationalization of command centres	Comd	O/PR	F
Improved and more robust communications links	Comm	PR/O	F
Senior officers put on watch to improve decision making	Comd	PE/PR	F
More needed to be said about recruitment and selection of commanders	Comd	PE/PR/O	U
More focus placed on number of coordination centres an not the people in them	Comd	O/PE	U
Right numbers of people in operations centres not matched by the right people	Comd	PE/O/PR	U
Promotions to senior positions automatic and not by appropriate selection	Comd	PE/PR	U
Political iterference reduced/negated the impact of the operaitonal review	Comd	PO	U
Lack of understanding about role of maritime coordination centres	Comd	PE/PR	U
Oganisational culture examined	Comd	PE/CU/O	F
Organisational structure taking advantage of new technology	Cord	O/PR/RE	F
Clarification given about rescue resources and coordination centres	Comd	RE/O	F

Selection competencies confined to general matters and not focused onoperationsl compentencies	Comd	PE	U

	Favourable (F) or Unfavourable (U)	People (PE)	Process (PR)	Resources (RE)	Organisation (O)	Political Influence (PO)	Cultural Influence (CU)	Totals
Command	F	2	2	1	3		1	**8**
	U	8	6		3	1		**18**
Control	F			1	1			**2**
	U							
Communications	F		2		2			**4**
	U	1	1					**2**
Co-ordination	F		1	1	1			**3**
	U							
Totals		**11**	**12**	**3**	**10**	**1**	**1**	**37**

The review was carried out to address a number of unfavourable situations with the UK Coastguard organisation that had been identified by managers and operational personnel through failures in the C4 framework during MME and minor emergencies. Table 6 lists some of the principle issues and improvements that arose from the review. All components of the C4 framework are identified to some extent or other, but in the main command issues needed to be addressed that involved people, processes and organisation. Essentially, the command structure was not fit for purpose, nor were the right type of people performing the right roles in the right places.

The opportunity was taken to take advantage of advances in technology to improve the organisational communications structure and reduce the number of command centres without affecting the Concept of Operations (CONOPS); CONOPS is a document that is written from the user's perspective and gives the user the modus operandi and objectives of their organisation.

These changes enabled improved staffing levels and a change in command levels; less centres allowed an increase in operational staffing levels and a more consolidated command regime.

There were several political issues with implementing the review which were discussed earlier in this study. Ultimately these were resolved to allow the majority of the review's recommendations to be implemented, but the political involvement introduced significant delays and costs to the review and in Scotland in particular it seriously reduced the impact of personnel changes to the region. Local issues arose through cultural differences between Coastguard teams and people who did not wish to lose what they considered was their local coastguard with the usual demand for things to be left as they were or lives would be lost(an often used claim when changes are proposed).

The political and cultural issues still prevail as the UK Coastguard goes forward to its Future Coastguard Strategy and there is still a misunderstanding about the role of central command centres. Although it is more likely that local politicians and volunteer coastguard personnel fully understand the role of central command centres but it suits their purpose to allow the media to misrepresent the situation. Moreover, I still believe that the right people are not in the right places and that the recruitment and selection processes need reviewing further and aligned more to emergency command roles rather than civil service administrative functions.

4.9 Case Study #7: Specification for JRCC Qatar – Organisational Issues

In 2008 I was commissioned as part of a commercial team to form a proposal to the Chairman of the Qatar Joint Rescue Co-ordination Centre (JRCC) for a JRCC in Qatar to cover the Persian Gulf Region in concert with Bahrain. The aim of the project was to establish a common C4 framework across the region and to seek a vision for the future over 5 and 10 year timescales including the design of a joint rescue co-ordination centre in Doha. The project also covered training. The Qatar government envisaged a JRCC to deal with all SAR aspects of aeronautical and maritime emergencies and saw benefits including fewer SAR facilities to maintain, lower staffing implications, lower costs, simplification of procedures, and common standards between air and maritime.

The SAR Convention 1979 formalised the concept of rescue co-ordination centres (RCCs) for maritime SAR – Maritime Rescue Co-ordination Centres (MRCCs) and Aeronautical Rescue Co-ordination Centres (ARCCs).JRCCs are a development of these two types of centre, the aim

being to combine both aspects into a single centre for the benefits stated above. In essence, according to the Convention,

> "*The RCC is an operational facility responsible for promoting efficient organisation of SAR services and for co-ordinating the conduct of SAR operations within an SRR"* (SAR Convention, 1979).

My experience in the UK dealing with separate MRCCs and ARCCs suggests that JRCCs are sensible operational solutions to potential management and C4 framework issues. As many resources provided by both the aviation and maritime worlds are commonly used in both contexts (aviation and maritime emergencies) it makes sense to have a common commander housed in a common operations centre. Situations have occurred in the UK with the ARCC exhibiting C2 over its air assets during a maritime emergency resulting in a conflict with the responsible RCC. It is also the case in the UK (and in many other IMO member states) that ARCCs are responsible for all aeronautical emergencies whether on land or at sea – even those that did not require air assets. Such incidents for the most part resulted in commanders at each centre reaching a joint decision to put the most operationally sensible centre in charge. However, this still did not prevent some commanders from not fully cooperating. This type of conflict can be resolved by the establishment of a JRCC. I discuss this further below.

The overarching responsibility for aeronautical SAR is the International Civil Aviation Authority (ICAO) in much the same way as the IMO has responsibility for maritime SAR. To resolve the potential conflict between air and sea SAR both bodies decided in the early 1990's to combine their respective SAR Manuals (the work instructions for the interpretation of the SAR Convention, 1979). This resulted in the production of the International Aeronautical and Maritime SAR (IAMSAR) Manual. I was personally involved with the drafting of the joint manual and could not believe how two manuals derived from the same Convention could have produced so many potential conflicts.

The Qatar proposal therefore provided a rare opportunity to provide a real-life opportunity to put the IAMSAR into practice and to establish a C4 framework organisation across when multi-command centres are active dealing with the same incident. For example the control of resources if different communications links are being used can disrupt the coordination of resources at the scene. With all of its sophistication in the management of an MME and tried and tested C4 framework the UK still has not managed to combine the approach to major

emergencies across all contexts. I discussed earlier in this study the police search for April Jones in Wales and the need for a common operating picture (COP). The same is true for aviation and maritime emergencies. The ultimate solution in terms of providing a COP is to have a common command centre for all types of major emergency but political, cultural and other C4 framework issues get in the way. This situation is not just prevalent across different contextual environments. I was carrying out a project review recently for the military and was astounded to find that a new and highly sophisticated helicopter armed with the most modern intelligence gathering technology had to rely wholly upon audio radio communication to pass the intelligence to its base and as such was affected by the difficulties involved with radio communication stability. It would seem that a data downlink had not been provided as part of the project for reasons I am not able to go into but suffice it to say that the proposed downlink was not entirely compatible with the military base equipment. It is therefore, clear to me that a solid foundation for the successful implementation of the C4 framework is a solid and joined up organisation.

During a recent visit (May 2015) to the UK Coastguard's National Maritime Operations Centre (NMOC) it was clear that an approach to a JRCC had been explored to combine functions of the ARCC with those of the MRCC. However, this development, which is said to take place in March 2016 is restricted to civil aeronautical SAR and does not include military SAR. This is disappointing as military aircraft downed in the sea, or indeed on land, invariably requires the use of civil assets coordinated by civil authorities. The rationale behind keeping the military SAR within the ARCC is understood to be based upon security and sensitivity of military assets. In my personal experience such requirements are few and far between and can impinge upon the timely rescue of military personnel and the response of military resources to a civil incident.

The CONOPS in place in the new National Maritime Operations Centre (NMOC) structure is based upon 'zoning'. The CONOPS in this case described the NMOC as the national centre in the UK that links all the subordinate centres through sophisticated communications links and under the command of a single individual. Basically, the UKSRR is divided into operational zones. Each zone is determined by the level of activity within the operational area and is handled by a local Coastguard Operations Centre (COC) staffed normally by three personnel on a day time only basis. Day to day operational activity is therefore handled by the COCs; night time incidents are handled by the NMOC – the desk arrays within the NMOC allow differentiation between operational zones. The NMOC is under the command of a senior controller who acts as the

commander in the event of a major maritime emergency. Clearly this is done remotely in concert with those commanding the local zone. Depending upon available resources and/or activity in the local zone that might interfere with the major emergency the commander might decide to 'offset' the more local activity to another zone to all them to focus on the major emergency. The CONOPS is yet to be tested and I have reservations about the handling of a major emergency that might involve the UK SOSREP and counter pollution teams who invariably work from a local base in the past in concert with local Coastguard commanders who had operational sway over decision making. In some ways this is similar to the remote commander experienced during the Prestige emergency where the Spanish MRCC undertook local SAR command and provided the communications links to the ship and the resources involved. It also provided the international liaison and the focus to some extent for the pollution. The commander was somewhat remote within a government administrative office. The links with the UK SOSREP and his CONOP is yet to be determined.

What is interesting about the new Coastguard CONOP is that in the 1960s and 70s the Coastguard CONOP had a network of Regional HQs (RHQ) and District HQs (DHQ) that had 'zones' covered by day watch stations supported by bad and thick weather watch stations (manned as the name implies during bad weather). Admittedly the number of RHQs and DHQs was some 32 and the day watch stations were in the hundreds but this was because of the lack of communications facilities and adequate range. It would seem that the new arrangement is not too dissimilar from that fifty years ago but enabled by much greater communications sophistication.

4.9.1 Identification of Key Statements/Observations

Table7 sets out the key statements/observations related to the establishment of the JRCC in Qatar.

Table 7 - JRCC Qatar Key Statements/Observations

Key Statement/Observation	Component: Command (Comd) Control (Cont); Communication (Com); Coordination (Cord)	Category: People (PE); Process (PR); Politics (PO); Resources (RE); Culture (CU); Organisation (O)	Favourable(F)/ Unfavourable(U)
A single Joint RCC to deal with all maritime/aviation emergencis with the country's SRR	Cont	O/RE	F
Benefits seen as including fewer SAR facilities to maintain, lower staffing implications, lower costs, simplification of procedures, and common standards between air and maritime.	Cont	O/RE	F
The RCC is an operational facility responsible for promoting efficient organisation of SAR services and for co-ordinating the conduct of SAR operations within an SRR". (SAR Convention, 1979).	Cord	PR/O/RE	F
Separate aviation and maritime RCCs can create conflict in resource allocation and control	Cont	PR/RE/O	U
Operational manuals for aviation and maritime the same	Comd	PR/O	F
Opportunity to combine aviation and maritime RCCs missed	Comd	O/PR/RE	U
Revised CONOP – due to improved technology	Comm	O/RE	F

	Favourable (F) or Unfavourable (U)	People (PE)	Process (PR)	Resources (RE)	Organisation (O)	Political Influence (PO)	Cultural Influence (CU)	Totals
Command	F		1		1			**2**
	U		2	2	2			**6**
Control	F			2	2			**4**
	U							
Communications	F			1	1			**2**
	U							
Co-ordination	F		1	1	1			**3**
	U							
Totals			**4**	**6**	**7**			**17**

I had limited exposure to the Qatar military that was the driving force behind the JRCC and communication with them was remote and involved my parent body fronting up the bid for the development work. Meetings with air force and government personnel were rather disjointed with representatives leaving the meeting then returning with a change of direction – not major but sufficient to need modifications to the proposed specification. I have not judged political influence to be a factor in the establishment of the JRCC as I have no real evidence to support the contention. However, I suspect that similar disagreements between government departments that prevailed in Case Study #3 occurred. The original intention of the air force was to build a new JRCC complex and start the development from a new perspective. Several months after the initial meeting the project was cancelled and the organisation in Qatar is as it was when the project was launched.

4.10 All Case Studies: Matrix of Issues from Key Statements/Observations

Table 8 shows the totals for all Favourable (F) and Unfavourable (U) issues from all my case studies. People and Processes are clearly in the majority and in particular these two categories are most prevalent as U issues representing over half the U issues among all categories and 20% of all issues Favourable (F) and Unfavourable (U) among all categories and C4 framework components. In my judgement, and it is only *my* judgement, the figures in Table 8 support my initial contention that it is the implementation of the C4 framework and human factors that can lead to a failure in the management of MME. What is surprising is that U issues in the process category are ahead of people issues. My interpretation of this is that it is again human factors that harm the implementation of processes. It does not surprise me that organisational issues score highly as in several of my case studies organisational failure or the complete lack of any competent organisation lead to failures in all C4 framework components. Communications and coordination show more F issues than U but this is not significant in my view given the subjective nature of my judgement on the case studies. My conclusion from Table 8 and the case studies from which it is derived is that there are more U issues than F (61% to 39%) and that the C4 framework can be improved by rectifying the U issues and aligning them with the F issues to form a positive approach.

Table 8 - Totals of Favourable and Unfavourable Key Statements/Observations

	Favourable (F) or Unfavourable (U)	People (PE)	Process (PR)	Resources (RE)	Organisation (O)	Political Influence (PO)	Cultural Influence (CU)	Totals
Command	F	13	11	2	7	5	5	**43**
	U	44	33	4	14	15	21	**131**
Control	F	4	8	8	10	4	2	**36**
	U	13	17	7	7	4	6	**54**
Communications	F	6	21	5	10	2	1	**44**
	U	11	13	1	5	1	2	**33**
Co-ordination	F	2	7	6	6	2	1	**24**
	U	5	4	4	2	0	1	**16**
Totals		**98**	**114**	**37**	**60**	**33**	**39**	**381**

4.11 Evaluation of Key Statements – People, Processes Resources, Organisation, Political and Cultural Influence

In my discussion of Table 8, I suggested that by turning the U issues into positive statements and aligning or merging them with the F issues a comprehensive doctrine could be developed to improve the implementation of the C4 framework and lead to more successful outcomes in the management of MME. In Table 9, I have marshalled all issues all from both Favourable (F) and Unfavourable (U) issues together into each of the six categories of People, Processes, Resources, Organisation, Political and Cultural Influences. In this table I have included the six professional principles at set out at the start of this study as exemplars of my approach to command. The 6 command principles are discussed further in Chapter 7 when matched against studies in cognitive decision making. In Table 9 each category is sub-divided as appropriate into Skills or Knowledge required of People, good practice in design when considering Resources or establishing an Organisation and also by design the issues that should be treated in advance of an MME involving political and cultural influence. The total of 36 principles listed in the table

can be addressed by recruitment, selection, training and exposure to experience (People) or by design (Processes, Resources, Organisation, and Political& Cultural Influences).There are many of the principles listed that some would say are *common sense* or *obvious.* In response I would suggest that if such principles were common sense and obvious why are failures in the implementation of the C4 framework still happening? In my judgement, and borne out by my professional practice and case studies, what is one person's common sense and what is obvious is different across many individuals. At the outset of this study I contended that it is the C4 framework implementation and not the framework itself that is flawed. Considering the totals for 'people' issues and the application of process together with political and cultural influences (arguably also people issues) in Table 8, against the framework's environmental issues (Resources and Organisation) they show 284 against 97; a 75% to 25% split, suggesting that my contention is not far wide of the mark.

Table 9 - Key Statements/Observations - Principles that can improve the implementation and design of the C4 Framework and success in the managment of an MME (initial principles highlighted in blue)

Label	People - Command
P1	Don't make decisions or act upon them until you have to – hasty decisions and actions can result in disastrous consequences. If you have time use it! Often there isn't time and decisions in an emergency need to be made quickly
P2	Don't dither and procrastinate when making a decision – opportunities for action may be lost
P3	Consult team members and attempt to reach consensus if there is time about options for action and accept that as a commander you don't, and cannot, know everything; empathise and listen to the opinions of others. But remember that a decision has to be made and it is you who has to make it
P4	Learn to fail – be courageous in accepting that a decision that you have taken is wrong and be prepared to take a different path
P5	Pre-determined plans can be useful tools at the outset of an emergency but avoid any plan that attempts to take you through a scenario
P6	Take every opportunity to gain operational experience however small – it will build your intuition and improve your heuristic responses.
	People - Skills
P7	Be able to assimilate and understand complex MME information, including the need for a COP, and determine options for action; prioritise decisions – know what is important to the success of the operation and what is not.
P8	Keep operational communications simple and use common words and phrases – avoid jargon
	People - Knowledge

P9	Fully understand the organisation in which the C4 framework resides and its external influences
P10	Understand all potential issues (legal, jurisdictional, procedural, political) that may affect the outcome of an MME
P11	Understand basic maritime nomenclature
P12	Understand the strategic, tactical and operational detail of all potential resources that can be involved in an MME
P13	Understand shipboard processes and procedures during an emergency on board and be able to identify sources of expert shipboard information and advice
P14	Within your command understand the geographical areas in which MMEs can occur and the location of potential safe havens for stricken vessels
	Process - Design
P15	Establish clear liaison links and procedures with external organisations both national and international – do not wait until an MME occurs
P16	Introduce Dynamic Risk Assessment procedures at key operational stages of the emergency to evaluate options for action – make it standard practice even if the same assessment is repeated several times.
P17	Establish clear SAR procedures for the preservation of life
P18	Appropriate level of command resident in operations centre and not remote – the right people in the right places at the right time
P19	Establish 'time-out' discussion periods with operational personnel at suitable points in the development of an MME
P20	Ensure communication links in the operational process connect to all potential resources for an emergency
P21	Ensure that all communications links are fit for purpose and are regularly tested and maintained
P22	Prepare all necessary paperwork as templates (legal, media etc.) in advance to avoid unnecessary delays
P23	Include checklists to enhance operational decision making and to improve information flow
P24	Introduce regular updates from all resources involved with the MME at key stages and align with Dynamic Risk Assessments
P25	Ensure all senior official/political and international dimensions involved in the emergency and those that need to are kept informed
P26	Ensure that contemporaneous records are kept and consideration given to records that may be required for any future legal actions
P27	Introduce situational modelling into the operational process
	Resources - Design
P28	Ensure that as many of the potential resources that may be used in an MME are owned by the commanding authority and if not operating agreements should establish clear command and control arrangements
	Organisation - Design

P29	Clear lines of command
P30	Regular review of organisation
P31	Ensure right level of command for MME
P32	Examine the organisational culture regularly
P33	A single joint RCC for all emergency resource (land, sea and air) should be established as an organisational ideal
P34	Organisational structure should monitor the development of and take advantage of new technology
	Political & Cultural Influences -Design
P35	Brief senior officials and government ministers on C4 framework and agree engagement MME protocols
P36	Conduct regular MME stakeholder seminars to ensure consistency of approach and cultural understanding of the C4 framework and involvement in MME

4.12 Comparison of Case Study Outcomes with Personal Principles

The 30 principles derived from my case studies together with the six personal principles tabulated in Chapter 1 form a consolidated list of principles as listed in Table 9. The results validate my initial views, also discussed in Chapter 1 that there were many principles in addition to my initial six that were present within the implementation of the C4 framework and management of MMEs that I had not articulated and consider aspects other than personal command.

I have already made it clear that they come with a health warning and that there are several dependencies within the list. For example, my principles of command (initial six) depend upon an efficient and well-designed organisation and a well-established and maintained communications infrastructure. As they are based upon my personal experience I feel that they are more objective than those from the case studies as the latter are derived mostly from third party evidence (transcripts, court evidence and so on), in particular Case Study#1 (Chapter 4).

All principles rely to some extent or other upon communications as is made clear at the beginning of this study (Chapter 2); For example, a commander with the best options for action who cannot communicate them or get feedback on the outcome is lost, or an organisation that does not comprise an appropriate communications infrastructure will be found lacking in the implementation of the C4 framework. I believe that all the principles I have listed are

operationally beneficial and if applied in total or in part should significantly enhance the implementation of the C4 framework and the chances of a favourable outcome in managing an MME.

In the next Chapter of this study I consider the views of other professionals in the emergency management field through a short survey.

Part III

Evaluating C4 – The Experience of Others – Professional and Academic

Chapter 5

Comparing my experiences with those of other commanders and emergency response personnel

5.1 Overview

In Chapter 1 I identified six personal principles of command from my experience and professional practice and in Chapter 4 I set out a list of 30 additional principles derived from key statements and observations in my case studies (Chapter 4). Whilst the principles derived from the case studies evidentially stand-alone, and in some cases support my personal principles, I felt some of my six personal principles would benefit from the views of other professionals in the field of emergency management, albeit to a limited extent. I identified three issues (Consultation, Plans and Experience) from my personal principles that I wished to evaluate with professionals across a wide geographical spread and across the boundaries of all fields of emergency response and not just maritime. The issues I chose from my six principles, and the reasons for choosing them, are provided in Table 10.

Table 10 - Principles Selected for Survey

Label	Principle	Reason for Selection
P2	Consultation/Consensus	I have witnessed a variety of views on the value of consultation and consensus and wished to evaluate the opinion of others
P5	Plans	My opinion of plans likely differs from those of other professionals in the field – seems a lot of support for – am I in the minority?
P6	Experience	Opinions about the value of experience vary (Shareen, 2007), Bronson and Merriman, 2011). Also covered in matching cognitive decision making studies (Chapter 6).

In Table 11, I list the remaining personal principles and the reasons why I did not include them in my survey.

Table 11 - Principles NOT Selected for Survey

Label	Principle	Reason for Selection
P1	Decision Delay	May be misinterpreted. Covered in matching cognitive studies exercise (Chapter 7). Also covered in Section 5.3.2.3 of this Chapter.

P3	Indecision	May be misinterpreted. Covered in matching cognitive studies exercise (Chapter 6). Also covered in Section 5.3.2.3 of this Chapter.
P4	Learn to Fail	May be misinterpreted. Covered in matching cognitive decision studies (Chapter 6)

In addition to seeking the views of other professionals on my personal principles, I sought views on certain qualities of commanders as I felt they were relevant to my study and the principles I have derived. The qualities I investigated are listed in Table 12 with reasons for doing so.

Table 12 - Qualities of Command Selected for Survey

Quality	Rationale
Charisma	I have often heard it said that charisma can carry a commander through and attract the support of his/her team in difficult circumstances. Is it generally considered a valuable attribute?
Authority	I believe that being authoritative during an emergency can be a positive attribute but is it aligned with charisma?
Flexibility	During many conversations with other emergency service professionals I have often heard that flexibility is the most important quality in a commander. Is it true?
Experience	Given its considered importance in other areas of this study I felt it should also be included within the survey as an individual quality to form a comparison with the attribute in Table 10.

The survey also invited respondents to rate the importance of testing potential recruits for decision-making qualities before being recruited. This question relates to all six of my personal principles, as being able to take decisions is, in my view, at the heart of being a successful commander.

The approach I adopted to identify respondents for the survey was to use LINKEDIN™[12]. The site includes a wide range of groups that focus on a variety of business activities including emergency management. I chose this site as it has global reach and has relatively easy access to the professionals I wished to address. The site is also able to host a questionnaire via a linked

[12]LINKEDIN™ a business oriented social networking site.

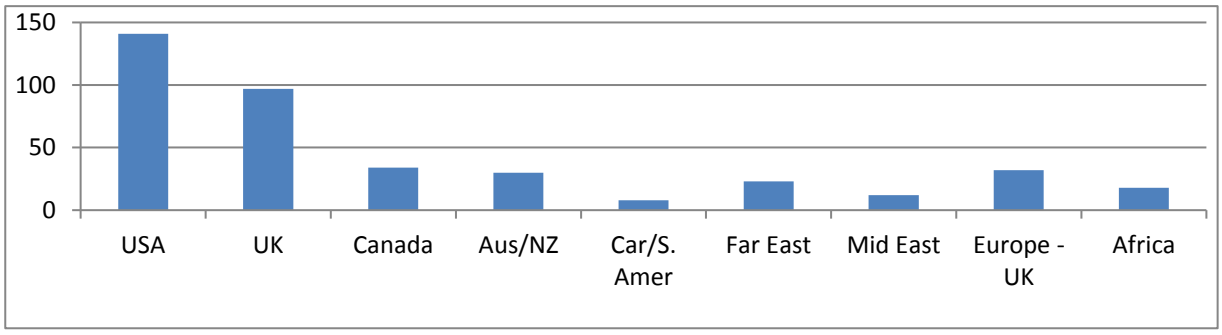
web site. I chose Survey Monkey™ as the questionnaire vehicle as it provided a straightforward route to formulating and presenting questions and would produce a web site that would guide the respondents through the questionnaire and submit them directly to me through my Survey Monkey™ account. Survey Monkey™ would also allow me to manipulate the data into charts and to assign comments into new categories as necessary.

The professional groups which were notified of the survey were: (membership Nos in brackets – accessed August 2015) - Crisis Response Journal™ (1412); Journal of Search and Rescue™ (1097); Maritime Education and Training (10918); Maritime Executive (60448);Professionals in Emergency Management (35057); Search and Rescue (841); Nautical Institute (15953); MCA (213). They were advised that they would be assisting with doctoral research, guided to the survey web site, and given a two-month response time frame. The membership of each group varies from the low hundreds to many thousands. I chose these groups as the most likely to contribute to my study. As can be seen the total membership population of the groups is circa 126000. The responses received were 395 (*n*=395), thus representing only a very small percentage (0.3) of the potential population. However, I suspect, but cannot confirm, that many of the 126000 members of these groups are not directly active in emergency management operations. Clearly I cannot claim that the responses were representative of the vast numbers of people around the world involved in emergency response, or indeed all the groups I invited to respond, but I consider responses to be largely representative of those involved in emergency operations. In this sense I consider the survey valid but limited. As this study is primarily about my own professional experience the survey is therefore only a glimpse of other people's experiences. I did not confine the survey only to those in the maritime field as I wished to look across emergency response boundaries. Moreover, the survey is a cross sectional study as out of necessity the questions posed and their results are the outcome of a snap-shot in time. It was not possible, for example, to follow the views of respondent groups over a period of time taking samples periodically. It is also true, in my view, that the experience ranges chosen can provide a degree of response bias; those indicating >25 years' experience on the one hand may not actually have >25 years' experience in terms of emergency incident exposure. On the other hand, those indicating <5 years' experience may have had substantial exposure and perhaps more than those with more 'time' in the role. Against this background, the survey must carry a health warning and although indicative only it still provides a useful indication of other professional's views.

The questionnaire at Annex A presented 15 questions that covered respondent's demographics, involvement and experience in major emergencies and their views on plans, the Favourable (F) and Unfavourable (U) qualities of commanders and views on team involvement. I chose these question areas to seek supporting or alternative views to my own professional experience, in particular their views on the qualities of commanders and their exhibited behaviours. As my previous experience of questionnaire suggested that responses would be limited, I kept it short and simple to encourage responses. Responses to the questionnaire are discussed in the following sections.

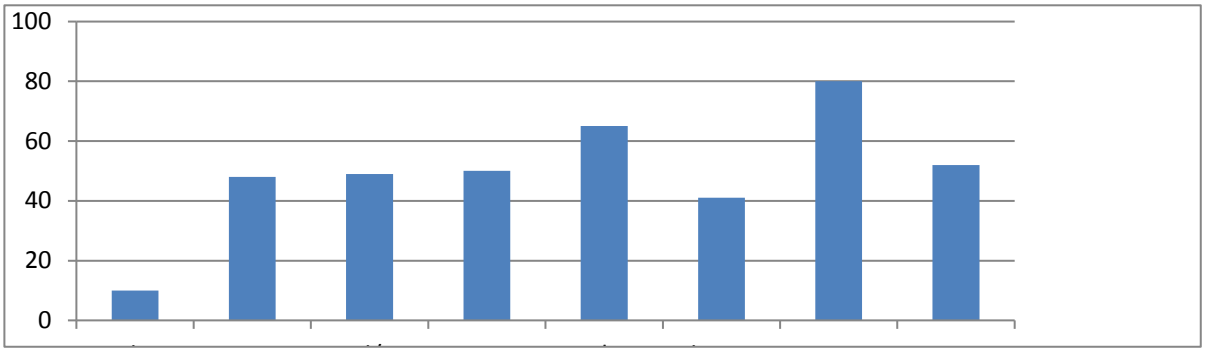
5.2 Demographics

Of the 395 responses, there were 316 male (80%) and 79 female (20%). The regions shown in Figure 11, which is skewed right, show that the survey results are global. More than 35% of responses were from the USA (141) and nearly 25% from the UK (97). The rest of Europe represented some 8% of responses similar to those from Canada and New Zealand. Around 85% of respondents came from regions that I would call developed in the C4 approach to emergency response; my experience suggests that as a generalisation Africa, the Far and Middle East are less developed in the implementation of the C4 framework (see for example, Chapter 4, Case Study #3).



egion	USA	UK	Canada	Australia/NZ	Caribbean/S. America	Far East	Middle East	Europe (minus UK)	Africa	**Total**
Responses	141	97	34	30	8	23	12	32	18	**395**

Figure 11 - Range of Respondents by Region (source author)



Category	Police	Fire	Medical/Ambulance	Emergency Support	Maritime	Other SAR	Commercial	State Response	Total
Responses	10	48	49	50	65	41	80	52	395

Figure 12- Range of Emergency Professional Groups (source author)

The categories of respondent indicate a good spread of emergency fields. The definition of Police, Fire, Medical/Ambulance and Maritime (Coastguard) are largely self-evident and are in line with the generally accepted understanding of the terms. Emergency support is defined as those respondents who work in the emergency response environment and are commonly recognised as directly involved with emergencies, such as the Red Cross (not medical) and local authority crisis management and emergency planning teams. Other SAR covers activities such as dive, cave and mountain rescue. Commercial indicates respondents from industry, for example, offshore oil/gas, chemical and general manufacturing. The State Response category arose through the additional field in the questionnaire seeking other types of response. As a large number (52) indicated that they belonged to a State-wide response system such as the Federal Emergency Management Agency (FEMA) in the USA, I considered it justified its own category.

5.3 Responses

5.3.1 Experience of Respondents

Respondents were invited to indicate how long they had worked in emergency operations and to say whether they had taken charge of major emergencies and how often. Figure 13 shows the age range of respondents with respective years' experience. Experience in this context is simply the number of years the respondent had been in an emergency response organisation.

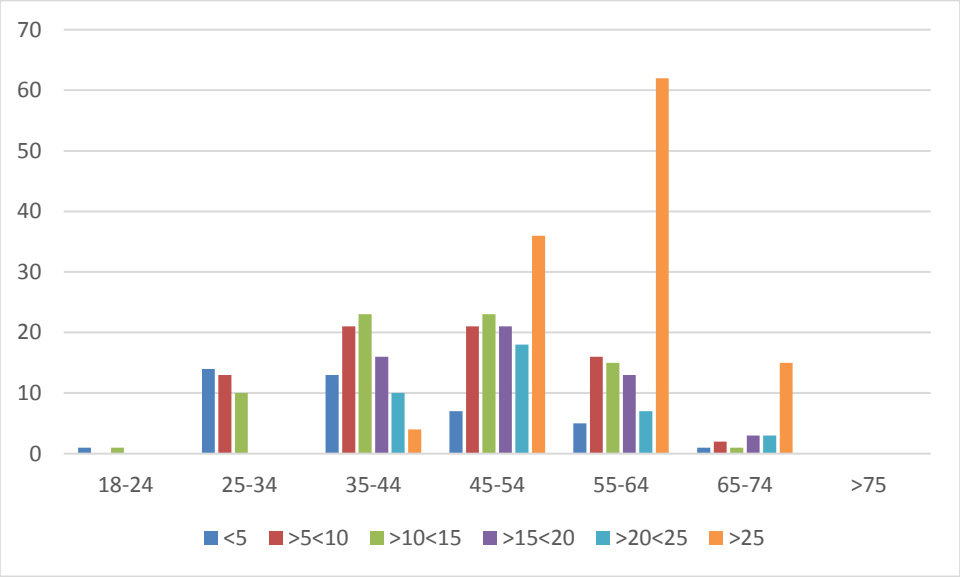


Figure 13 - Respondents by Age and Years' Experience (source author)

As expected the older the respondent generally the more years' experience was indicated in the survey and the younger the respondent, generally less experience. I mentioned earlier in this study that years' experience as indicated in the survey does not necessarily reflect the amount of experience a responder has accumulated or indeed whether they have actually learned from the all the experiences that have had.

To gauge a better understanding of the respondents experience in dealing with major emergencies the questionnaire asked how many such incidents had been handled per year and whether they had taken command of a major emergency. Over 35% had taken command of a

major emergency but around 70% of the respondents had taken charge of lesser emergencies. The remainder had been involved with emergencies of both types as observers and in my opinion had valid views about the question responses; observers often have a clearer idea of the overall emergency response picture than those consumed within the issues of command. Figure 14 shows that the majority of respondents handled fewer than 5 major incidents per year. My definition of a major incident contained within the survey was "*major is any emergency that involves multiple casualties, major damage to buildings/community infrastructure"*. If respondents wished to elaborate on this definition they were allowed to do so. Comments included, dealing with emergencies in excess of available resources; incidents where the impact would cost in excess of $500k US or >$1M US. Some indicated that a major emergency was any incident where resources were used external to their communities. All of these definitions fall under by definition and are sub-categories of the same definition. Other responses included, *"Major Emergencies are just when more than two different responsible agencies are involved, with their planning, operational and logistic capacity".* This definition does not fall within my understanding of a major emergency and can cover any incident from a road traffic accident to a house fire without danger to life or other property where the fire service and police are involved. Those that responded in this way also considered that they handled in excess of 25 major emergencies per year.

Clearly there can be a range of definitions of a major emergency which appears to be dependent upon the context placed upon them by the individual or organisation. The majority of respondents however considered a definition which fell within the meaning I have given to a major emergency; 29 respondents (8%) classified a major emergency mostly toward the minor incident definition and misunderstood the survey in terms of major emergencies. Nevertheless, the perception of a major emergency in the mind of the respondent is important and in this study the lower end of the emergency range did not disqualify their input to the remaining survey results.

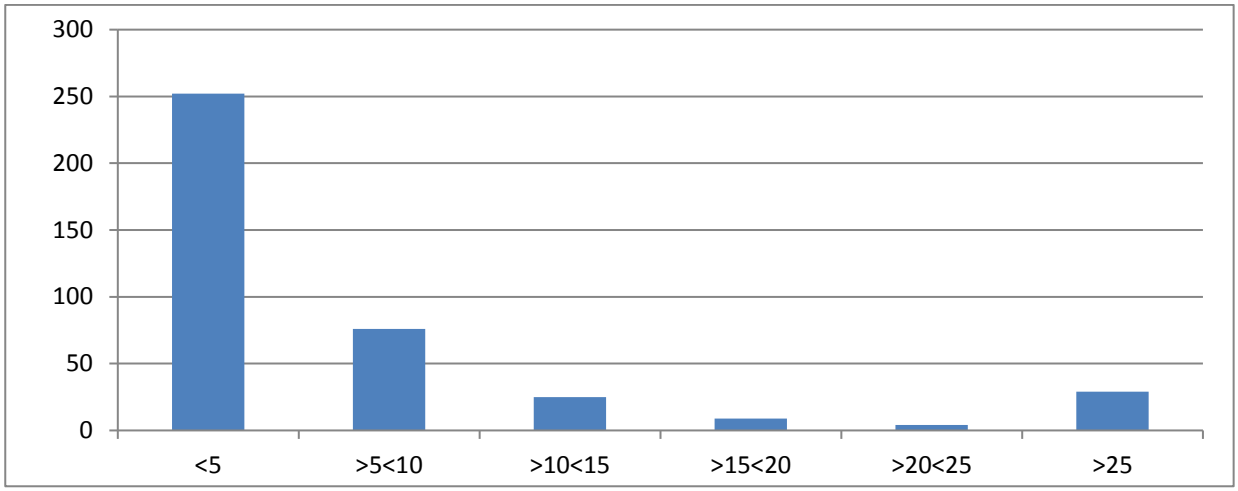


Figure 14 - Annual Number of Major Incidents Handled by Respondents (source author)

5.3.2 Operational Activities

Respondents were invited to rate certain operational activities as set out in Table 10[13] in terms of importance (see Figures 15, 16 and 17). The charts show a comparison between those with <5 years' experience and those with >25 years' experience, by percentage responses within each category (Figure 15), together with the >5 to <15 (Figure 16), and >15 to <25 (Figure 17). These are raw number comparisons. I chose the <5 and >25 years' experience comparison as I felt that those with less experience might give different responses to those with extensive experience. Whilst the histograms (Figures 15, 16 and 17) are raw data it was necessary to test the significance of the differences between the responses each experience category. For the statistical test I chose the *Z score test* for two population proportions (one year experience set against another, e.g. <5 against >25). From the *Z test* the *p value* or probability can be determined to show that the two proportions from the experience range are either the same or significantly different at the 1% (0.001) or 5% (0.05) level; null hypothesis, P1-P2 = 0, where P1 is, say <5 years' experience and P2 is >25 years' experience. For the *Z test* and derived *p values* I used the *Social Science Statistical Calculator* (socialsciencestatistics.com web site). Table 13 shows a statistical comparison between each experience range and the question asked. My treatment of significance is straightforward; if the difference between two categories is 5% or less (down to 1%) I have judged the responses to the categories as significantly different and the

[13]Note: Consensus is used as a label to cover Consultation and Consensus as it is assumed that consensus can only be reached through consultation.

respondents holding different views about the question in hand. With the exception of having pre-determined plans, which has no significant differences between years' experience, each category has some significant differences. The responses to each question are discussed separately

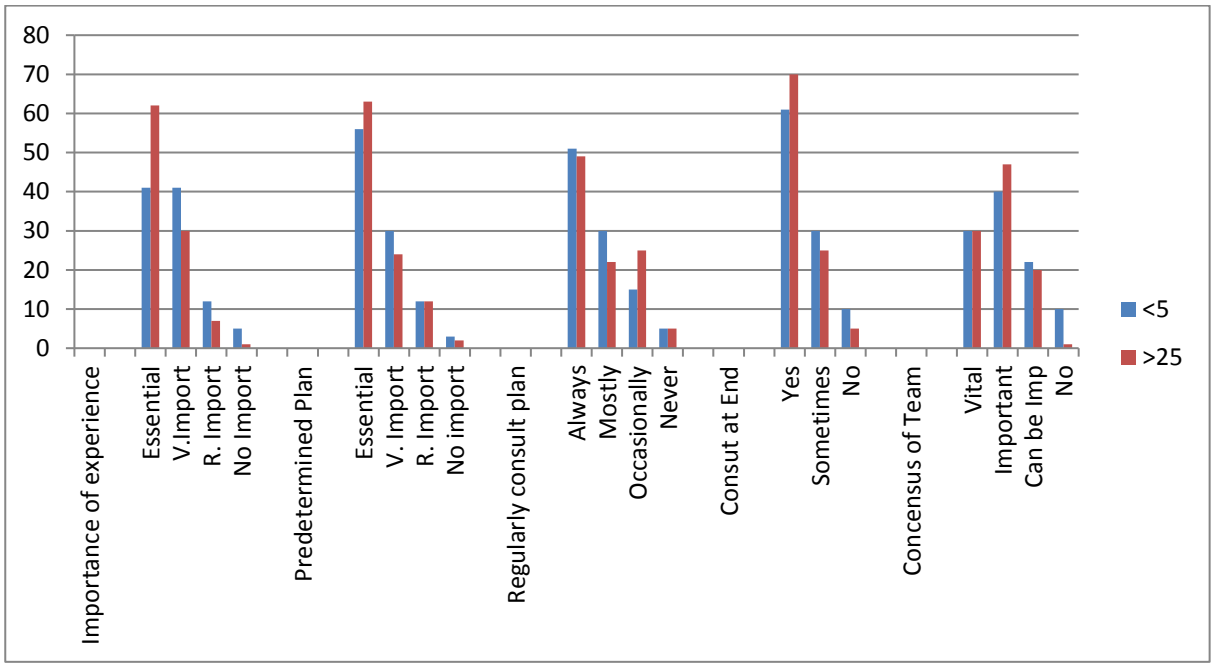


Figure 15 - Comparison of Operational Activities <5>25 Years' Experience (%) (source author)

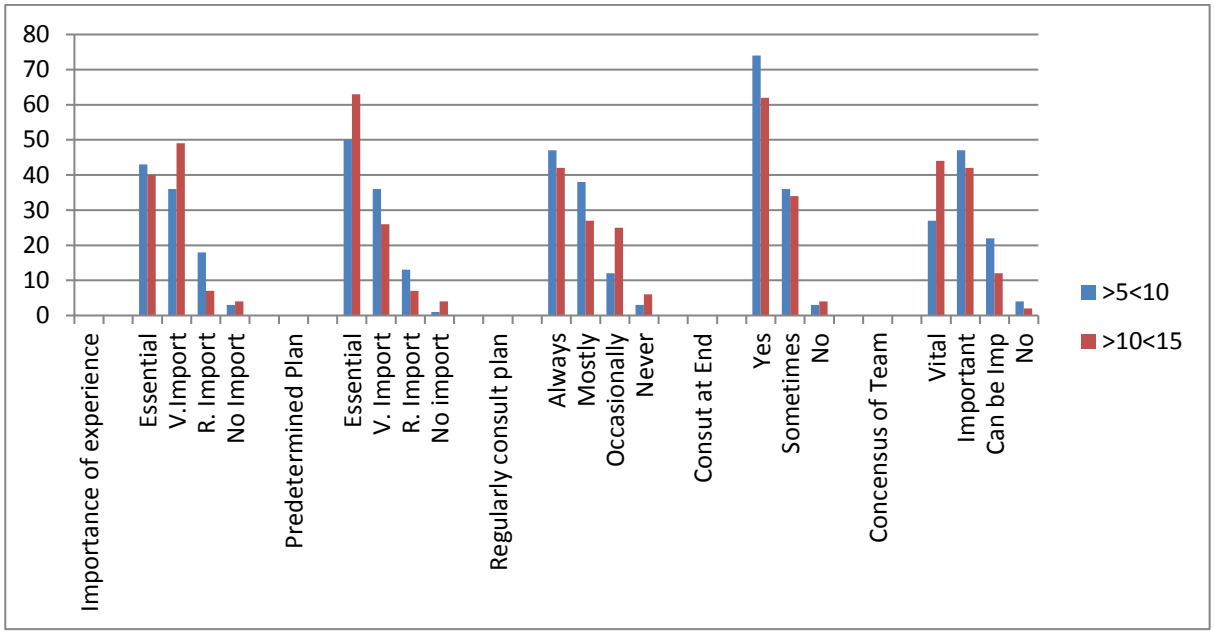


Figure 16 - Comparison of Operational Activities >5<10 and >10<15 Years' Experience (%) (source author)

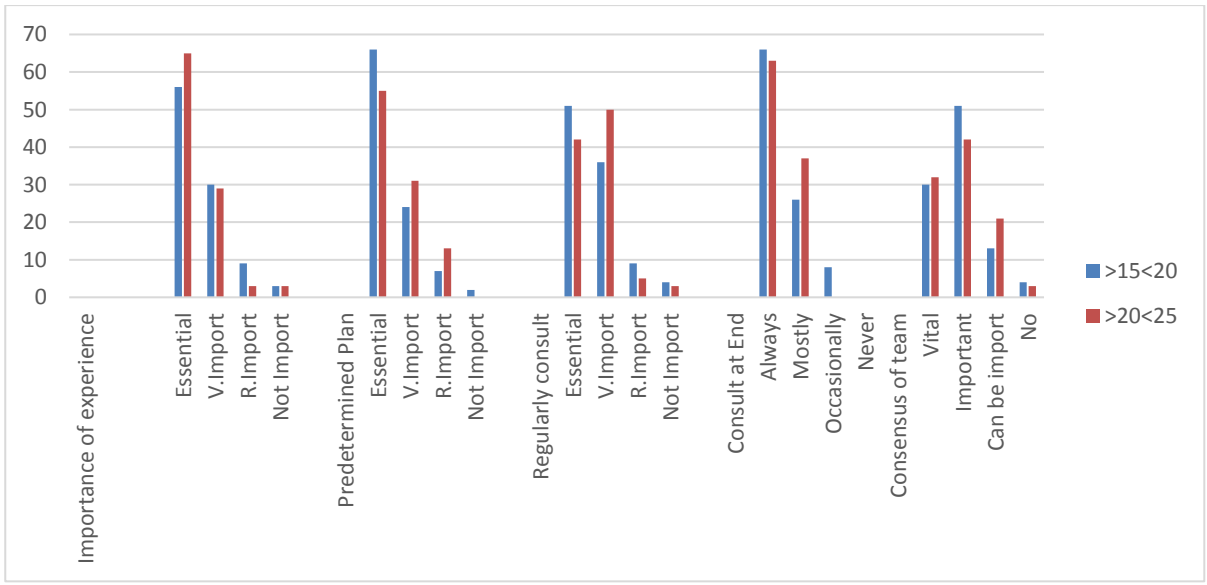


Figure 17 - Comparison of Operational Activities >15<20 and >20<25 Years' Experience (%) (source author)

Table 13 - Comparison of % Operational Activities/Qualities for <5 to >25 Years' Experience to within 1% (orange) and 5% (blue) Significance of Probability *p* using *z Test* for two population proportions – populations in brackets

Activity	<5 (41)	>25 (117)	Value of *p*	>5 <10 (73)	>10 <15 (73)	Value of *p*	>15 <20 (53)	>20 <25 (38)	Value of *p*
Importance of Experience									
Essential	17	72	**0.02574**	31	29	0.72786	30	25	0.37886
Very important	17	34	0.1443	26	36	0.09492	16	11	0.89656
Reasonably important	5	9	0.3843	13	5	**0.00048**	5	1	0.19706
Not important	5	1	**0.00108**	5	1	0.9492	3	3	0.67448
Pre-determined Plans									
Essential	23	73	0.4777	36	46	0.09492	35	21	0.29834
Very important	12	27	0.42942	36	26	0.14986	13	12	0.4973
Reasonably important	5	14	0.9681	26	19	0.2113	13	12	0.4593
Not important	3	2	0.3742	1	0	0.31732	1	0	0.39532
Regularly Consult Plan									
Always	21	57	0.77948	34	31	0.61708	27	16	**0.0027**
Mostly	12	26	0.36282	28	20	0.15814	19	19	**0.0000**
Occasionally	6	29	0.17702	9	18	0.0586	5	2	**0.0000**
Never	2	5	0.87288	2	4	0.4065	2	1	0.76418
Consult Plan at End									
Yes	25	82	0.28462	54	45	0.11184	35	24	0.77948
Sometimes	12	30	**0.0000**	17	25	0.1443	14	14	0.28944
Never	4	5	0.1936	2	4	0.40654	4	0	0.08364
Consult/Consensus of Team									
Vital	12	35	0.93624	20	32	**0.03846**	16	12	0.88866
Important but not vital	16	55	0.37886	34	31	0.61708	27	16	0.40654
Can be important	9	24	0.8493	16	9	0.12356	7	8	0.19706
Not important at all	6	1	**0.00022**	3	1	0.3125	3	2	0.93624

5.3.2.1 Command Experience

A question about the value of experience in leading an operational emergency produced a response indicating that over half thought experience is essential and 35% thought it very important. Of the remaining 12% only around 1% said they did not think it important and 11% thought is reasonably important.

A comparison of responses between the <5 and > 25 years' experience shows, at the 5% significance level, that those with extensive experience (>25) consider experience to be essential whereas those with less experience (<5) appear less convinced. This is somewhat confirmed by the 'not important' responses which show that the less experienced consider this to be the case over the more experienced. There is also a significant difference at the 1% level between those in the middle experience range (>5<10 and >10<15); the bias (more respondents) is toward the >5<10 range. This result arises I believe from those in the >10<15 considering experience to be either essential or important.

The overall conclusion I draw from the responses to this question is that the more experience gained in emergency response the more likely respondents are to feel that experience is more important. This is in line with my observations and the exhibited behaviour I have witnessed. I have found that some individuals who fail to get promoted in deference to younger '*less experienced*' candidates often voice the opinion that '*experience seems to count for nothing.* Such people appear to have missed the point that is expressed below by some respondents about time served, and considered experience to be related to the number of incidents that an individual is exposed to and not the number of years in the job. For example, one responded in the >5<10 category said:

> *"Not a question of years but of number of "events" encountered. You can spend a whole year without a major emergency and have 3 in a row the very same day. You're not experienced until you have to deal with several "events" at the same time"*

For the most part I concur with this view as it largely supports my professional experience that an individual can reside in an operational role for many years yet gain little experience due to *limited emergency exposure*. On the other hand, another individual can be in a role for a short time but be involved in many more emergencies and gain a great deal more experience (providing of course that they learn from it). That said, it is likely that time served and exposure

to emergencies are both valid and should be considered when selecting commanders. The ability to build experiences into one's heuristic armoury is of course not a simple quantitative exercise on the basis of incident numbers, it also depends on the many individual characteristics of the individual and their ability to assimilate and understand operational experience.

In addition to the value of experience, respondents were asked to consider how long such experience should be. The majority of responses indicated around 5 years but no less than 3. This is a reasonable indicator as many organisations will have sufficient frequency of incidents to allow operators sufficient exposure within this time frame. During my review of the UK Coastguard Service I examined the frequency of incidents (Case Study #6) for each MRCC and sub centre together with the times zones in which they occurred. Given the 12 hour watch keeping regime for the UK Coastguard at the time (still in existence) and the location of the MRCC/sub centre exposure was obviously greater for the busier locations and less so for the quieter ones. My conclusion at the time of the review was that 3 to 5 years for the busier and quieter centres respectively was about right before individuals were experienced enough to move on to their first command position. During this time they experienced between 100 and 200 incidents of varying types and of a minor nature carrying out a variety of roles within the C4 framework. However, the number of MMEs that individuals would have experienced over these time frames would be far less and in some cases individuals may not experience an MME over a 5 year time span. I see minor emergencies as preparation for MMEs as the same C4 framework prevails; it is the outcome or consequences of failure that tend to be more serious. Of course, individuals take on experiences in different ways. Sharen (2007) carried out a survey of 18 to 25 year olds (no population defined) and concluded that *"the youth today really don't value experience".* Nearly two thirds of those surveyed (Sharen, 2007) thought that their ideal leader was under the age of 40. To some extent this result is in line with my results in that the less experienced the respondent, and presumably the younger they were, experience was not such a big deal. Bronson and Merriman (2011) suggest that due to people spending more and more time with people our own age this is limiting children from learning from each other. They further contend that this trend *"may be creating a whole generation who do not have the ability to understand people who have different experiences due to age".* That said, Sharen's survey (2007) registered 56% of respondents who thought that age was an important factor in leadership. The question this poses for me '*is age being connected with experience and thus leadership or is being older a good thing to have in a leader regardless of their experience, or is experience being assumed because of age?"* I conclude that age and experience are not

necessarily mutually inclusive and the combination of both is extremely complex, and the best one can do is to ensure that potential commanders are exposed to as many emergencies as possible and that this can only really be accomplished over time, probably over several or more years.

5.3.2.2 Plans and their Application

I posed a question in the survey about having a pre-determined plan for an MME and whether respondents consulted it during the emergency, or afterwards to check that their actions were in line with what was expected and to justify them. I do not have a great opinion of plans in general and I tend to concur with von Moltke (Burgess, 1963) that plans only tend to be useful for first contact and after that the "*strategy is a sequence of expedients"*. I have often found plans to be either too vast or attempting to cover every eventual scenario, or in contrast sparse with a few names and contact numbers, sometimes out of date, as to be almost useless. I have discussed earlier in Chapter 4 that I tend to view contingency plans more as 'arrangements' rather than plans; a plan implies a particular course of action for a particular scenario. As von Moltke (Burgess, 1963) contends, as the emergency progresses it calls for '*a sequence of expedients'*; it is the emergency that dictates the strategy, tactics, and operational processes that need to be applied and the commander who interprets and resolves through his/her decisions. An emergency response is therefore a partnership between the emergency and the commander and not a one-sided dictate.

There are no significant responses to the question on having pre-determined plans between all experience ranges. With regard to pre-determined plans, over 60% of respondents said they are essential and around 28% thought they are very important. It would seem, therefore, that the overwhelming majority of respondents considered plans to be essential. Rather contradictory to this result is that a little less than 72% said that they always or mostly consulted plans. This suggests that nearly a quarter of respondents who said that plans are essential or very important, only occasionally or never consulted them. It could be that not all respondents had plans or if they did they were not helpful during an emergency, or perhaps paying lip service to some mandatory requirement or other. More than 67% said they consulted the plans after an emergency to check if they had followed the right procedure or to justify the actions they had taken. Apart from a few (<1%), the majority consulted a plan at the end or sometimes did so. I

have found this latter action prevalent when an inquiry follows an emergency and adherence to the plan is likely to be held in evidence at an inquiry (for example, Chapter 4, Case study#1).

Overall, the professionals in emergency management consulted, consider plans to be an important aspect of managing an emergency. I agree that they are indeed important at the outset (depending upon how they are drafted) but that they should be flexible and able to apply to all scenarios (all hazards approach), and should set out arrangements for dealing with any emergency. They should not be prescriptive and should not define particular courses of action for particular events, as events have a habit of not turning out as predicted. Plans are useful training tools but in the wrong hands can hinder the success of an emergency. If the available plan is scenario based and relied upon too heavily, and it does not fit the emergency's circumstances, the outcome could be failure.

There are significant differences to consulting plans, at the 1% level, between the latter range of respondents (>15<20 and >20<25) for responses of 'always, down to occasionally'. I deduce from the responses that those with the least experience and those with the most, generally agreed that a pre-determined plan was either essential or very important, but some differences in their consultation. There is a rather tentative conclusion that can be drawn from this result, that the older respondents went back to their original thoughts about plans being important but did not always consult them. However, as the survey does not uncover what sort of plans each age group refer to, any conclusion would be difficult to draw. It may be that the type of plan the less experienced were thinking about was a scenario-based plan giving detailed guidance and the older respondents were considering a less detailed advisory plan. As I have said, my preference is for a 'first engagement' advisory plan that can be used as a basis for a developing scenario. I believe that this approach can prevent commanders making decisions that may be difficult to change as the emergency progresses.

Interestingly, the majority of respondents consulted their plan at the end of an emergency. Significantly, at the 1% level, more so between the <5 and >25 experience range in favour of the <5 (more likely to consult at end. There are many possible reasons for this, including a desire to ensure that what the plan contains is valid, but I have also witnessed plans being consulted to validate the actions taken or to prepare for an inquiry or investigation. For example, in the Prestige incident court case (Chapter 4, Case Study #1) the plans involved – Spanish NCP and the French Biscay Plan – were cited repeatedly, often in defence of the commander, yet during the

incident were seldom if ever referred to; indeed the Plan had not been revised in any way since its inception in 1990 and the incident occurred in 2002. My overall conclusion from this aspect of the survey, given its limited scope, is that plans are generally seen as having value but as so many appear to rely upon them they should be carefully constructed and flexible enough to allow commanders freedom of choice.

5.3.2.3 Team Consultation and Consensus

I have long held the belief that team consultation and, whenever possible and practicable, consensus, are important features in the management of an MME and indeed in handling incidents in general. I explore this point further in Chapter 6 in my appraisal of cognitive decision making studies. I feel it is important in any endeavour, including MMEs, to carry your team with you if you wish to gain honest and valuable opinion and support. However, the commander must ultimately make a decision following consultation and attempts at consensus, if there is time to do so, and not allow his or her team to procrastinate; nor must the commander dither when considering what his or her team contributes to the data pool and consequently delay timely action. I have witnessed the behaviour of commanders where the principle of consensus has been adopted as the *'right thing to do'* but where a strong-minded individual has been allowed to take over discussions and lead the commander to decisions that he or she may not have made and which have proved failures. (See Chapter 6 and my comments about consultation and Mindguards (Janis, 1982)) I have also witnessed cases where team consensus discussions have been allowed to go on for too long while the commander waits for what they consider to be a vital piece of information, which never comes and delays appropriate timely action. I therefor included a question about team consensus in the survey.

Respondents were asked about the importance of team consensus during an emergency. I recognise that it is not possible always to arrive at a common opinion about an operational decision, but a commander that strives for consensus (providing there is time) in my view will always take on the views of his or her team. Some 46% considered it important but not vital and 32% considered it vital. Of the remainder, 18% said it can be important and 4% did not consider it important at all. Of the 117 additional comments received to this question the majority thought that it depended upon the circumstances and the input from the team can often be ignored for example:

"*Everyone has different opinions and ideals of success. Bench marking against the Command Intent will always identify areas for improvement, yet are rarely acknowledged".*

"Support for the incident commander's decision is vital even if you think there is a better option"

The latter comment is particularly relevant to the relationship between a commander and his/her subordinates and can provide a classic point of failure. Later in this study I discuss cross cockpit gradient in the aviation industry, when a co-pilot does not challenge the commands of the aircraft captain, and how this leads to disastrous failure.

There is a significant difference, at the 5% level, between the middle experience ranges, in terms of consultation being vital. The more experienced professionals think consultation more vital than those in the lower range. This is in line with the general view of respondents, albeit significant. Perhaps more interestingly, the responses from the <5 and >25 years' experience range agreed precisely in terms of consensus being vital but was significantly different (<1% significance) in suggesting that consensus was not important at all. The lower level response came from the >25 year category which is perhaps not surprising because I believe there are qualities of some commanders that mitigate against commanders consulting their teams and these are discussed briefly in the next section; refer to Case Study #1 where there was very limited attempt at consensus and when it did occur, it was ignored. The situation in Case Study #3 did not allow command consensus to any degree because of the disjoined C4 framework organisation.

In summary, the responses to experience, plans and consultation agree for the most part with my views. However, and perhaps not surprisingly, the less experienced responders tend to differ from my view on the need for experience. With regard to plans, the view appears to be contrary to mine if the plans are scenario related and they are seen as an important attribute to emergency situations, but there is agreement with my contention that the less experienced a commander is the more likely they will consult a plan. The exception to this is the wholly arrogant commander who thinks they are beyond consulting anything or anyone (Chapter 4, Case Study #1). Consulting a plan after an event would appear to be consistent with my view that 'looking for an excuse for actions that have failed' is quite prevalent.

I consider that the views of the operational team are important and should be taken into account but should not delay decision making, or interfere with the commander's overall responsibility to make the final timely decisions. I feel that it is incumbent upon a commander to listen to advice and to have the courage to take it, and act upon it as the situation requires. It may not always be possible to reach a consensus, particularly in MMEs, but nevertheless views should be taken. The cross cockpit gradient situation (Last, 1999) can prevail in emergency situations. There are several comments in response to this survey question, along the following lines:

> *"There are many instances when options can not (sic) be made via democratic means. Input and the providing of options is important but, ultimately the Incident Commander must command"*

I agree with this comment and endorse it as a principle that I command by (P2).

5.4 Qualities Required of an Effective Commander

During my career I have witnessed many behaviours from commanders whilst implementing the C4 framework, and have found that certain of these commanders can have a favourable or unfavourable effect of the outcome of an MME in one way or another. I posed a question in the survey that listed the exhibited behaviours and invited respondents to identify the importance or otherwise of each in terms of qualities that made a good commander. They were ranked from vital to not so important or not important at all. Figure 18 shows the overall responses to each quality. Figures 18 shows the results for a comparison of experience ranges from <5 up to, and including, >25 years' experience. The data has been equalized to the lowest group, >20<25 years' experience; the total number of respondents in this group was 38 thus this equals , i.e. 1. The definitions of each behaviour are those in common use and found in the Oxford Dictionary.

Charismatic: Compelling attractiveness or charm that can inspire devotion in others;

Authoritative: Able to be trusted as being accurate or true; reliable;

Flexible: Able to be modified to respond to altered circumstances;

Experienced: Having gained knowledge or skills in a particular field over time.

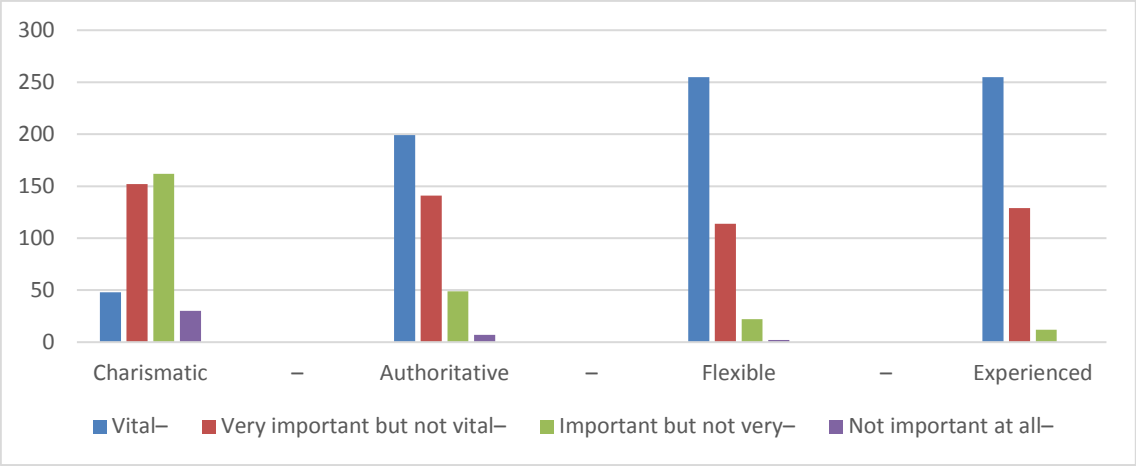


Figure 18 - Overall Results for Commander Qualities by Number of Respondents (source author)

It is clear that charisma is not considered vital by the majority of respondents but it is still considered very important by many. The remainder consider it not so important or not at all (around 25). My opinion is that charisma can be helpful in dealing with the media but not always a helpful quality in a commander; charm can give the illusion of competence and I have witnessed this on many occasions. The quality was considered by Donaldson (1994) in his report on C2 for salvage and intervention and he thought it an important quality for a secretary of state's representative (SOSREP) for salvage and intervention. I disagree, and as a panel member selecting the first full-time SOSREP we did not select an individual who had charisma, in fact the individual was very modest and, he will forgive me for saying so I'm sure, did not exude charm. The individual went on to be an extremely successful SOSREP. The qualities he did have in abundance were flexibility, the ability to draw out others views and to make timely decisions with authority. We later discovered that he also had a profound sense of humour which took him through very many difficult and complex situations. Unfortunately, humour is not a behaviour that one can test for to any extent during a selection process.

The general view from respondents is that a commander who is authoritative is either vital or very important to the successful outcome of an emergency. In dealing with the many different aspects of an MME and the conflicting points of view from demanding organisations I have often found that commanders who demonstrate authority supported by an ability to command respect, tend to get things done and are supported in their decisions. The respect given to commanders is often earned through experience and the ability to listen to the views of others – they invariably have a good track record of success and are able to acknowledge and learn

from their failures. To paraphrase Walker (2009) it is the human ingredient in C2, and thus the human implementing the C4 framework, that makes all the difference to the successful outcome of an emergency.

Flexibility is seen by nearly 95% of respondents as either vital or very important, the remainder see it as important but not very. Less than 1% thought it not important at all. During a recent visit to the UK Coastguard National Operations Centre the duty commander thought that flexibility was probably the most important quality in a commander. I agree and have found that one of my own principles I operate by, "*learning to fail"* is essential in guiding an MME to a successful outcome. I noted in discussing Case Study #1 that the commander involved made a decision literally within the first five minutes of an MME and failed to modify it over the six days in which the emergency ran. He had many opportunities to do so but failed to realise that the course of action he had chosen was leading to a disastrous outcome. A commander can be forgiven most things in my view, but a complete failure to have the courage to change his or her mind when it is abundantly clear that a wrong decision has been made is absolutely unforgiveable.

The one quality in a commander that exceeds flexibility, as being considered vital or very important, is experience. I have discussed experience earlier in this Chapter, but with regard to whether respondents felt it important for them to have experience in taking command and how many years they felt justified being called 'experienced'. The suggestion was that 3 to 5 years is about right but that experience is not simply a matter of years but frequent exposure to incidents, and, in my view, learning from the event. The results earlier in Figure 18 are broadly in line with those in Figure 19. It is unlikely in my view that a commander responsible for an MME would have less than 5 years' experience and more usually around 15 years, notwithstanding the opportunity to do so, before they find their way through the career system and into a senior command position. In the meantime they would invariably have had exposure to many minor emergencies and observed MMEs. That said, on rare occasions, individuals who have gained experience in dealing with major emergencies in non-maritime environments, such as aviation or the public emergency services, can be recruited directly into a maritime command position, find themselves as MME commanders. They have not always been successful; the exception that proves the rule is the very first official SOSREP who gained a wide variety of experience in the offshore industry, stunt diving fraternity, SAR lifeboat organisation, and as a trading standards officer.

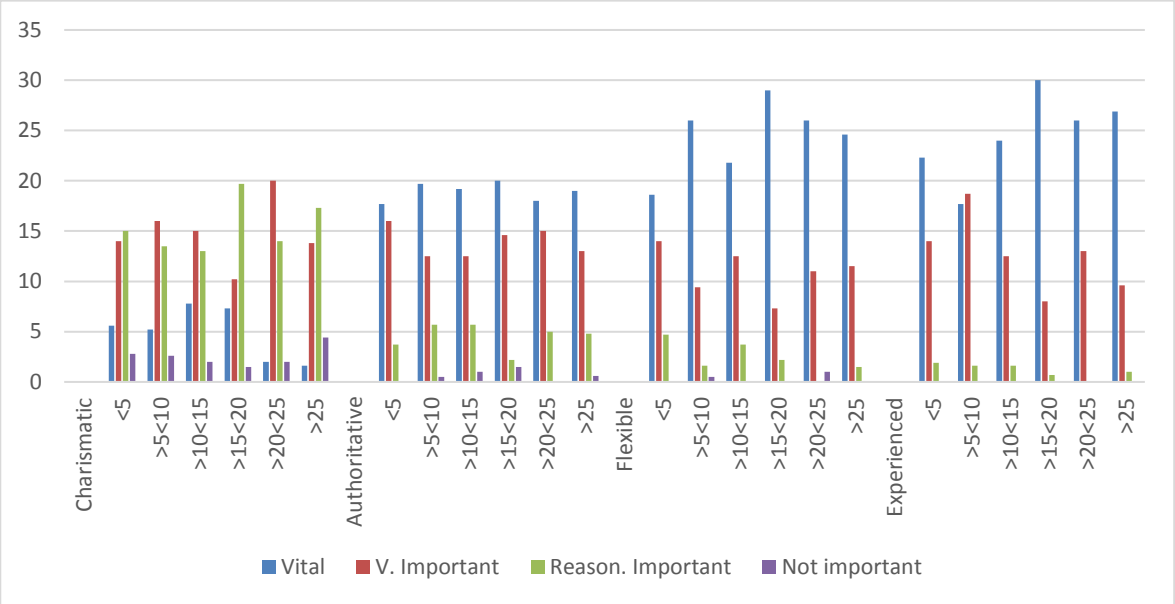


Figure 19 - Commander Qualities by Range of Experience Equalised to Unity by Numbers of Respondents (source author)

It is clear from the survey data that charisma is the only quality that is not considered the most important. It is interesting to note that in the more experienced ranges the popularity of charisma drops off. I suggested earlier in this Chapter that charisma needs to be strongly supported by other qualities and cannot in itself stand alone as a commander quality. My experience appears to have been shared to some extent with many of those with long experience, responding to the survey classing charisma as reasonably important – with the supporting caveat I mentioned earlier.

There is unanimous agreement that an authoritative commander who is flexible and experienced would be a preferred option, and I agree, but with all of these qualities they carry health warnings as in isolation they are, in my view, largely meaningless; for example, an authoritative commander without experience, similarly a charismatic commander who has no authority.

5.5 Testing before Selection for Command

When invited to rate the need to test potential recruits for their ability to make decisions before recruiting them, respondents replied as set out in Figure 20. It is clear that the overwhelming

majority of respondents across all experience levels considered the need to test a potential recruit to be very important or important. Those with less experience in the <5 years category rated the need more highly than any other category when taking very important and important ratings together. This outcome confirms, at least from those who responded to my survey, that there is a need for another principle within those already derived to improve the successful implementation of the C4 framework. Whilst it may be harsh to suggest that all potential emergency professional recruits should be evaluated for the ability to make decisions, many emergency response organisations, in my case the maritime sector, can promote individuals to senior position without a solid evaluation of their ability to take command and to make decisions under pressure. Therefore, I have added this requirement as a skill to my list of principles.

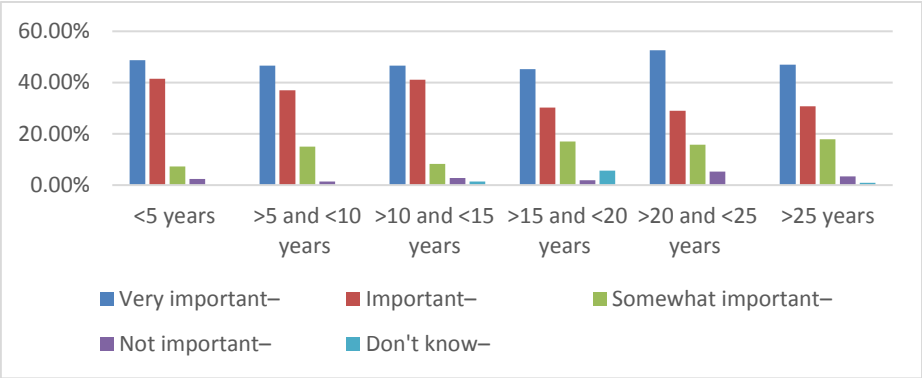


Figure 20 - Testing of Potential Recruits for Decision Making by % Years' Experience of Respondents (source author)

5.6 Summary of Questionnaire Results

The survey was carried out to support, or add to, the findings from my experience, professional practice and case studies and so represents some evidence from sources other than my own, and extends the evaluation of my practice to emergency practitioners from many different emergency response organisations from across the globe. Regardless of the diversity of the respondents there are many areas that support my own professional experience and assist in suggesting potential improvements in the management of the implementation of the C4 framework, for example ensuring that commanders host appropriate qualities for command, and the need to evaluate for command decision making, at the very least, candidates identified

for command positions. Any disagreements I have with respondents appear to be in the less experienced category, which is perhaps not surprising given my own long experience.

My views about the four qualities of operational commanders are largely supported, with the exception of charisma. It is perhaps surprising that regardless of the number of years' experience respondents had, whether less than five or in the majority of cases, greater than 25, many views expressed were in agreement. It is perhaps unsurprising that those with the greater experience contend that experience is probably an important attribute for operational commanders together with flexibility. In both these qualities the trend toward its importance is upward from the less to the more experienced. There is also agreement among respondents about the need to evaluate potential recruits in command decision-making.

In Part IV of this study, in which I set out my conclusions, I shall consider the impact of the survey results on the main body of my study, as derived from my case studies and professional practice, to describe what I consider to be my contribution to the implementation of the C4 framework in the management of an MME. This Chapter has identified three additional principles.

People – Commander Qualities
Potential recruits for emergency response organisations and at least those identified for command positions should be evaluated for their ability to make decisions.
Candidates for command positions should have a minimum of 3 years' experience within a professional emergency response organisation.
Commanders must be evaluated for and exhibit: Flexibility in their approach to decision-making, and demonstrate authority in command

5.7 The Story so far

This study describes the components of the C4 framework as they apply to the management of an MME. The descriptions and relationships I have identified are based upon my experience only and should be interpreted as such. I have set out the relationship between each C4 framework component in several diagrams (Figures 3 and 4) and have drawn a detailed activity map (Figure 6) showing the interface and interactions of each component together with the

overarching categories in which they reside; people, processes, resources, organisation, political and cultural influences; each of these categories have been discussed. In my introduction and background to the study I suggest that the C4 framework itself is sound (as I have described it) but it is flawed implementation that can result in unfavourable outcomes in handling an MME. I identify several command principles that I have adopted throughout my career and I offer these, together with an additional set of principles for the implementation of the C4 framework.

As exemplars of the implementation of the C4 framework and its categories, I have discussed seven case studies derived from my public works and have drawn from them key statements and observations that I judge are applicable to the implementation of the C4 framework. The key statements and observations are considered as either favourable (F) or unfavourable (U) to the successful outcome of an MME. The unfavourable factors are turned into positive principles and together with the favourable factors form a list of my principles as discussed above. I emphasise that these principles are neither exhaustive nor prescriptive but are set out as guidance based upon my professional experience and judgement.

Chapter 6

Matching Practiced-based Principles with Constructs from Decision Making Studies

6.1 Introduction

The purpose of this Chapter is to match my 6 command principles (Chapter 1) against relevant decision making constructs discussed in the research literature; cognitive studies and the psychology of thinking approaches during non-maritime emergencies. The remaining principles from my Case Studies and survey analysis set out in Chapter 4 and 5 respectively that concern other aspects of the C4 framework are not considered within the cognitive bias appraisal as they are adequately addressed elsewhere within this study. However, I have included within this chapter a separate but limited review of psychological literature and thinking approaches, covering many other principles, from non-maritime fields to support or otherwise my cognitive appraisal. During this review of decision-making constructs I have sought to identify additional principles that may be favourable to the successful implementation of the C4 framework during an MME, whilst at the same time recognising that there may be constructs that do not support them. I recognise that emotion, about which there is a great deal of literature, plays a part in decision making and often subconsciously interacts with, and can affect and vice versa (e.g. Ekman 2007, Frijda 1988, Gilbert 2006, Keltner & Lerner 2010, Keltner *et al*. 2014, Lazarus 1991, Loewenstein *et al*.2001, Scherer & Ekman 1984), cognitive decision making. In this study I have confined my matching exercise in this chapter largely to cognition as the principles I have identified rely for the most part on a cognitive approach. The inclusion of highly unpredictable emotional bias would be too extensive to treat given the limitations of this study. In this sense, therefore, the appraisal in this Chapter is emotionally neutral. I first address cognitive biases against each of my 6 command principles, then go on to discuss the psychology of decision making within the medical, aviation, nuclear and other land-based emergency services. Therefore, each of my 6 command principles is considered against cognitive studies in the first instance followed by a section covering decision making, decision making errors in accident and emergency, and not restricted to the maritime industry.

In my search for relevant cognitive decision making studies I have reviewed the taxonomy produced during the RECOBIA Project[14]. The taxonomy was accompanied by 544 reference sources for cognitive biases that have been identified in published studies of cognitive behaviour. In addition I also reviewed Carter, Kaufmann, & Michel (2007) which provided a

[14]Reduction of Cognitive Biases in Intelligent Analysis (RECOBIA) -The aim of the RECOBIA project was to improve the quality of intelligence analysis by reducing the negative impact of cognitive biases upon intelligence analysis. The EUROSINT FORUM was in charge of this task. The EUROSINT FORUM is a pan-European network of over 400 intelligence professionals working in agencies and administrations across the Member States and EU institutions.

taxonomy of 73 biases identified in the extant literature. As expected there was a high degree of duplication in the Carter *et al*. (2007) taxonomy with that of the RECOBIA Project's comprehensive list. From these two extensive sources I selected those studies that I considered most relevant to my principles and to the decision making biases prevalent within the C4 framework and the management of an MME. Whilst there are a wide range of biases applicable to decision making I have focused on those that apply more readily to decisions taken under pressure and with severe time constraints. Moreover, many of the biases appear to cover similar issues, for example, the anchoring effect and anchoring adjustment, and the availability, availability cascade, and availability heuristic. In addition to the Carter *et al.* (2007) and RECOBIA taxonomies I considered emotional aspects of decision making (Loewenstein & Lerner 2003, Keltner & Lerner 2010, Ekman 2007, Frijda 1988, Gilbert 2006, Keltner & Lerner 2010, Keltner *et al*. 2014, Lazarus 1991, Loewenstein *et al.* 2001, Scherer & Ekman 1984) which, although helpful, due to their complexity and my very limited understanding of the psychology involved and competence I chose not to include a critical appraisal within this Chapter. Although I have not specifically touching upon emotion as a psychological issue, as I discuss System 1 and System 2 thinking Kahneman (2011) in Section 6.2.2, I felt it worth drawing a link between emotion and thinking. Lerner *et al* (2014) make the point that "*Emotions are not necessarily a form of heuristic "System 1" thought. Emotions are initially elicited rapidly and can trigger swift action, consistent with "System 1." But once activated, some emotions (e.g., sadness) can trigger systematic "System 2" thought."*

I have adopted a dual approach to this Chapter. First, I consider each of my six previously discussed principles, identifying in the literature empirical and/or theoretical studies that serve to corroborate or undermine them. Second, I have sought studies and thinking approaches through real-life examples that reveal additional principles that resonate with my experience but for which I have not, until now, considered as 'principles' *per se.*

6.1.1 Information

Each of the principles described and discussed in this Chapter rely to a greater or lesser extent on information. Information also plays a significant part in the additional principles derived from my appraisal of the cognitive decision studies, and the psychology of decision making in general. Therefore, throughout this Chapter information forms an intrinsic part in the discussion of all

principles so I have decided not to discuss 'information' *per se* as a separate entity, but to discuss it as it arises within the particular principle under discussion.

6.2 Principle 1 Decisions: Timelines

There are two aspects to this principle (Don't make decisions or act upon them until you need to): the first - deciding on a course of action and the second – taking the action itself. The former US President Franklin D. Roosevelt once said, *"There is a time when we must firmly choose the course we will follow, or the relentless drift of events will make the decision"* (Adair, 2011). I concur with Roosevelt's assertion (see principle P2 and Figure 21), which refers to the first part of my principle, but would add: "…but don't act upon it until you have to". That said, I propose to keep faith with Roosevelt, and I add to my phrase: "…but don't allow making the decision to drag on otherwise the time for action may be past." The skill, of course, is to know when to make the decision and not allow the situation to drag on to a state where acting upon it is overtaken by events or opportunities are lost. Why is it then that some decision makers (commanders), know when the time is right to make an important decision and others delay up to the point that whatever decision is made, is largely pointless and disaster is already at the door? Given plenty of time and all possible information, consultation (more of which later in this Chapter under P3) can take place, options can be considered in detail, risks analysed and consequences evaluated. However, in an emergency situation, decisions may have to be made within minutes or at the very least a few hours and based upon limited and often inaccurate or misleading information. Figure 21 shows the process of deciding on a course of action and acting upon it. In an emergency it may be that the action immediately follows the 'what to do' decision. Sometimes the action may not be immediately required and there is time to monitor the situation, possibly consult with others, refine the initial decision, then take action. The situation thereafter is monitored and future decisions and options for action considered.

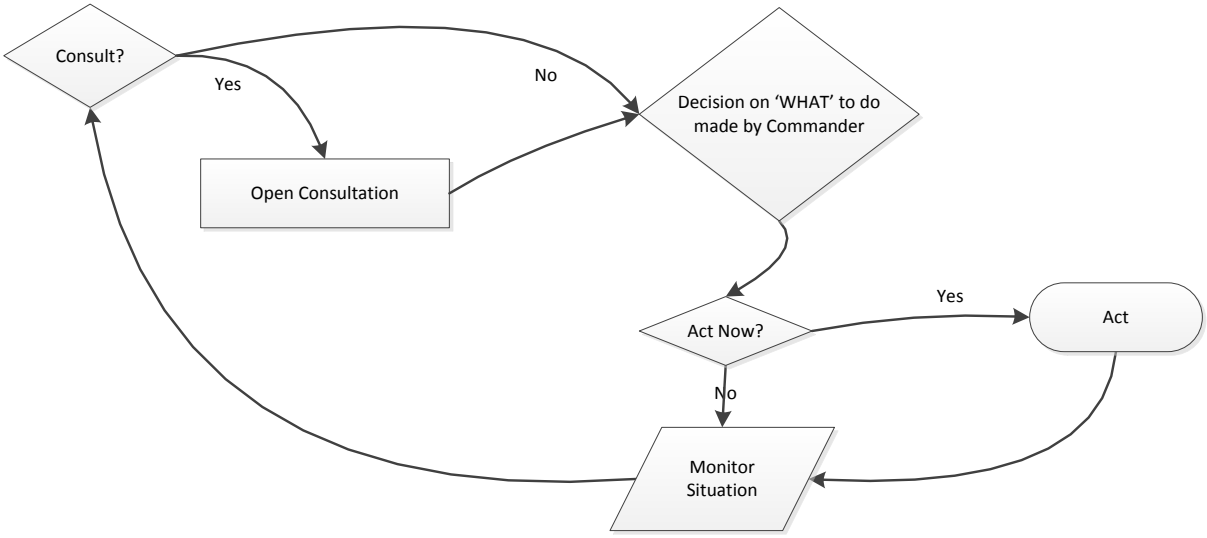


Figure 21 - Decisions and Actions (source author)

It is interesting to note a recent article in *The Observer* newspaper (Observer website, 2011) following a poll of voters about the qualities of political leaders, that the UK's Prime Minister David Cameron was rated quite highly as a decisive leader (nearly 45% of the poll against the 100% Churchill Index) and above all other UK political party leaders. In contrast in the *Financial Times* (FT Website 2015), he is accused of 'dithering' and a lack of leadership over a decision on the expansion of Heathrow Airport (although the reasons for this might be political). It would seem that in the space of a few days, if the media is to be believed, a highly rated decisive leader can go to a leader that dithers.

6.2.1 Delay in Making a Decision

In my view, there are therefore two types of delay associated with my first principle (P1): delay in making a decision and delay in implementing it. I considered turning the two types of delay into two separate principles or two sub-principles of P1, but have decided against it on the basis that decision making and associated delays are mutually inclusive and should be considered as a whole. Moreover, the timing of a decision is invariably dependent upon the information available to the commander, and how much information is required for a decision to be made; commanders will of course have different thresholds in this regard.

Information processing (Kahneman, Slovic &Tversky, 1982; Nesbett & Ross, 1980; Turk & Slovery, 1988) can rely on three judgemental heuristics; anchoring (as mentioned earlier), availability (the bias produced by previous events having a disproportionate influence on our judgement), and representativeness (being misled by facts that appear to fit together (Kahneman & Tversky, 1972) which may not necessarily be true). In my first principle of command – don't make decisions until you have to – I am suggesting that commanders should consider all available information and not rely upon what they don't know arriving anytime soon. Delaying a decision for the arrival of information that could be used in a later phase of an emergency and considered under a *System 2* (Kahneman, 2011) can result in opportunities being missed and unnecessary delays in taking action. I recall a phrase during my career that was said to have originated from an early 20th century handbook (although I cannot verify it) for Coastguards that purported to say that action, even though it may not be quite the right action is preferable to masterly inactivity. There have been many uses of this phrase since the early 19th century when it was reported first used in America by Representative John Randolph in a debate in 1828 (Mackintosh, 1838, and Register of Debates in Congress, 1828) when he suggested to the Congress: *"We ought to observe that practice which is the hardest of all—especially for young physicians—we ought to throw in no medicine at all—to abstain—to observe a wise and masterly inactivity."* More recently it has also been associated with the medical fraternity, for example, Vaile and Griffith (1997) refer to "masterly inactivity but cat-like observation" when referring to the management of asymptomatic aortic stenosis in patients. They make the point that in the vast majority of cases taking no intervention action but keeping very close observation is the wisest course of action. It occurs to me now that the Coastguard anecdotal reference considered masterly inactivity as doing nothing and urged coastguard to "do something" rather than nothing at all. However, it is clear from its history that is not what the phrase means. Deciding to observe a situation closely and not to intervene is a valuable decision in itself and cannot be said to be 'doing nothing'.

Because delaying a decision is an intrinsic part of my first principle it requires further consideration here (it is also considered later in this Chapter). There are many texts that consider delay as a tactic in decision making. For example, Spangler (2003) discussed delay as a tactic in legal proceedings or to avoid an unwanted decision by those resistant to change. Whilst this could apply to my Case Study # 7 (Chapter 4), it does not directly apply to decisions delayed by commanders in dealing with an MME. I have found material that broadly aligns with my

principle and gives an interesting perspective on it. Van den Ven *et al.* (2010) make the point in their paper about delay, doubt and decision that

> *"…decision makers should be aware that the decision to delay making a choice is not a neutral act: It alters the choices they make in a predictable direction."*

The authors discuss (in a political election context) how delaying a choice (for the voter) reduces the appeal of normative options. For example, a voter not faced with a delay in voting at an election may choose candidate A but if a delay in voting occurs they may change their minds away from how they would normally have voted. Van deer Ven *et al.* (2010) also suggest that delaying a choice can indicate doubt by the decision maker. The inference of this discussion on my first principle is two-fold. First, I do not contend that delaying a decision in some way confers a competitive advantage on the outcome other than waiting for more accurate and timely information and thus making a more informed decision, but it does imply that a delay can change the mind of the commander even without new information if the delay is unjustified or unnecessary. The important point for me is that commanders have to be absolutely clear why they are delaying making a choice and need to be certain that time is available to allow a delay. The second point is that the commander must avoid giving the impression of doubt to those around him or her and be clear in communicating his or her reasons for delaying a decision.

6.2.2 Delay in Acting on Decision

Once a decision is made, and the timing is right it should be actioned. A delay in acting upon a decision once made (second type of delay inherent within P1 as discussed earlier) presents its own problems and issues. More often than not a decision once made is acted upon almost immediately (see Figure 21) but there may be occasions when a commander may wish to delay the action as the timing may not be quite right, for example the commander may wait for an abatement in the weather and the decision that has been taken is conditional upon the weather abating, and as soon as this occurs the decision is actioned; this could be something as straightforward as putting a salvage crew on board a stricken ship to take it in tow (Chapter 4, Case Studies #1 and #2). However, such delays can result in the receipt of additional information that the commander may consider affects the initial decision. In such cases the commander, if time permits, may wish to consult further and check the validity of the initial decision. In my view this is sensible providing each step is considered clearly and positively and

does not turn into dithering and indecision and it is clear to all involved the reasons why such steps are being taken. It may be that the outcome of checking the validity of the first decision results in a modified or alternative decision. Again, there is nothing wrong with this outcome providing that there are good and clear reasons for the change.

In an MME, procedures concerning the notification to concerned authorities and individuals and the activation of some resources are handled by subordinate personnel and can be a standard response to almost any MME. For example, the activation of SAR resources and notification to operational and administrative personnel to establish a command centre. However, the evaluation of initial information from the emergency is the responsibility of the commander and he or she may have to make an immediate decision in the knowledge that they may be dealing with inaccurate data – in my experience a frequent occurrence in the first hours of an MME.

There is a deal of literature that considers decision making when the information available is limited and time is short but it tends to focus on non-emergency situations (at least not the type of emergency that prevails in the context of an MME), for example, texts on project management and economics or fiscal management. It is interesting to note that whilst my experience in these fields, other than in a strategic senior management context, is very limited there are recognisable and clear similarities in the biases that prevail in both business and the management of an MME. I feel confident, therefore, in aligning my principles with texts in these fields, and in my appraisal have sought out the main points of similarity; those points of a bias that could apply regardless of the context in which it may be found.

Virine & Trumper (2008) in their consideration of project decisions discuss Time Delay Traps and suggest they occur when a project manager cannot balance long-term and short-term goals. As an example they consider the delivery of a software product at the expense of its architecture; initially the delivered software works but is later let down by the system architecture. I recognise this situation in the manufacture of kitchen white goods, as reported in many media outlets, (for example, *Which,* July 2014, Home & Energy) that are commonly considered to be almost 'programmed' to break down after a few years to ensure that new goods are purchased. The goal is not therefore to produce a product that lasts indefinitely, although this is never admitted by manufacturers because they wish to be seen as providing a good product that lasts. In the MME context, the commander implementing the C4 framework has a similar dilemma, although unlike a manufacturer will not have all available information at the outset of an

emergency (unlike a manufacturer) that will enable a long-term decision to be made. Nor does the commander necessarily have any ulterior motive behind his or her short termism (Chapter 4, Case Study #1). Therefore, in the context of Principle P1 I have not considered short or long term goals as either a new principle or a sub-principle as decisions in an MME are made on the basis of resolving the situation at hand as quickly and as effectively as possible, and not to seek a competitive advantage, even if there are deliberate delays.

The availability of information a commander has to hand can of course help with this dilemma but in my experience, commanders tend to make short-term decisions in the hope that as the emergency progresses better information becomes available and the decision they have taken does not prevent adopting new, perhaps more radical, options later. For example, in the initial stage of an MME the first priority is the preservation of life and, if the initial information suggests a ship might be likely to sink in what could be severe weather conditions, the crew are invariably evacuated. However, if shortly after the crew are evacuated they are needed back on board the ship to accept a tow to prevent the vessel grounding or leaking polluting oil, it may turn out that evacuating all the crew in the first instance was not the most appropriate action, even though it appeared to be the right (short-term) decision at the time.

Situations like the one described above happen often, as exemplified by Case Study #1 (Chapter 4). Intuitively, many commanders know that if they do not evacuate a stricken ship's crew, and deaths subsequently occur, political and media criticism would be extremely intense. This sort of decision is an example of an *anchoring heuristic* as discussed by Virine & Trumper (2008) and, where *insufficient adjustment* has taken place (referred to by Baron (1998) as *underadjustment*), the experienced commander understands at the outset of an emergency that there will be a need to deal with a stricken vessel and the likelihood is that certain crewmembers will be required on board. However, this decision remains *anchored* in the preservation of life mode and avoids (perhaps not unreasonably) any risk associated with any longer-term option. I have found that with experience, competent commanders, will seek the views (if possible) of the ship's master or other senior officer about the true state of the vessel and the potential for salvage; it may be that the initial information received is inaccurate or misleading, and may lead to wrong short-term decisions – initial communications cannot always be relied upon and all too often are taken on face value. What appears to be a disastrous situation at the outset may not in fact be the case. I can relate to the anchoring heuristic bias as I have fallen victim to it on many occasions during my career. I have tended to stick with what I

know and not take any risks. However, as my confidence has grown, I have become less risk averse and more likely to be less 'anchored'. This heuristic is, therefore, relevant to principle P1.

In making an initial decision when dealing with an MME it is important not to jump to conclusions unless they have a sound basis. For example, having dealt with a number of MMEs involving oil tankers it may be reasonable to conclude that if it is damaged or sinks it will leak oil and pollute the environment, and will require a decision and resources to prevent this happening. On the other hand, it may not be a reasonable to conclude that a cruise liner will require the same response. However, this contrary conclusion may itself be wrong, as even cruise liners carry large amounts of fuel (known as bunkers) and can seriously pollute the environment. Kahneman (2011) suggests that it may be acceptable to jump to conclusions if they are likely to be correct and the cost of occasionally getting it wrong is tolerable, particularly if there is no time to collect more information to form a better decision. It is clear then that intuitive errors are probable (Kahneman, 2011) in the first stages of an MME decision process. However, if *what you see is all there is (WYSIATI) (*Kahneman, 2011), a commander may have little choice but to go with his or her intuition unless they take a risk and predict what they think might happen on the basis of past experience; this approach may be riskier than they think as situations tend not to repeat themselves in exactly the same way.

In many ways the decisions taken at the outset of an MME could be classed as a *System 1* heuristic or knee-jerk response in Kahneman's (2011) two system classification; *System 1 – Thinking Fast and System 2 – Thinking Slow.* I prefer to identify the initial phase of an MME decision process as a *System 1.5*; there is a mixture of heuristic and analytical response. Considering the two-system model of Kahneman (2011), it occurs to me that in any given situation with two different commanders one more experienced than the other might consider many of the issues (fuller range of options for example) than would be considered by another commander who may be the less experienced. Whilst both could be considered to be in a System I state, i.e. in the initial immediacy of an emergency, the former may be closer to what the less experienced commander may consider to be a State II. Deciding to do nothing but observe and wait for further information, may be an option for the less experienced commander whilst the more experienced may already have reached the point in his/her evaluation that a decision is possible. In short, given two commanders of differing experience the decision timeline may be fundamentally different.

Some options and calculations may be carried out in the commander's head alone and others more consensually, although nevertheless quickly, considered. For example, it may be an obvious intuitive reaction to despatch rescue resources to an MME, but deciding which ones may require consideration of speed and distance and other vectors depending upon the location of the emergency; bearing in mind that the location may not be accurate and leastwise may be on the move. As a young Coastguard Officer I practiced identifying places on the local navigational charts by remembering the latitude and longitude of prominent locations, including those of rescue resources. In this way I could assess the best resources to respond to any incident once the relative position of the emergency was known; I seldom needed to consult with an actual chart until after I had initialised the response. Other, perhaps more experienced officers than me always consulted the charts and resource locations and parameters introducing a delay of many minutes into the response. Basically I took a risk on my ability to assimilate situations in my head; thankfully it worked; my caveat here is that the operational geographical area was not vast.

I have not found any studies that contradict my first principle but several indicate the need for clarity about delaying decisions, for example, know why a delay is a good choice. Baron (2000) in discussing uncertainty and reasons for choice considers reluctance to act without some clear reasons – the need for a goal and a clear outcome. He makes the point that doing nothing can result from having more reasons or more than one option available to a decision maker. He suggests that the heuristic of not acting without a reason is generally a good one but,

> "*if you would take the action in all possible states of the world – despite reasons being different in different states then you might as well decide to take it, you do have reasons, although your reasons may not yet be known to you."* (Baron, 2000, p.274).

People need clear reasons to abandon their default option. Clearly different commanders will have different default options and thus different starting points at the outset of a decision process in the C4 framework.

A sub-principle of P1 to consider delay in reaching a decision or acting upon it is:

People - Command
It must be clearly understood why making or acting upon a decision is delayed

6.3 Principle 2 Don't Dither, Decide

My second command principle - Don't dither and procrastinate – may appear on the face of it the same as my first principle, but it is not. I consider indecision, or dithering, to be a characteristic of a commander who repeatedly changes their mind when faced with a range of new information, or the introduction of another point of view. Kahneman (2012) makes the point that being 'undecided' should not be confused with being 'indecisive'. Being undecided is a state prior to making a decision whereas being indecisive is repeatedly changing one's mind without any rationale intent or process toward a firm decision – what I call, dithering. The situation is set out in Figure 22 which indicates the actions of an indecisive commander. For example, a cliff top diver may decide on the type of dive they are to perform from a 100 foot cliff but when they arrive at the cliff top may re-consider due to the prevailing wind or state of the sea or they may wait until they get to the cliff top before deciding on the type of dive; this is not indecision but a decision having been made with a sensible delay before action. If the diver was indecisive no firm decision would be made either before arriving or after arriving at the cliff top, and he may even change his mind half-way down.

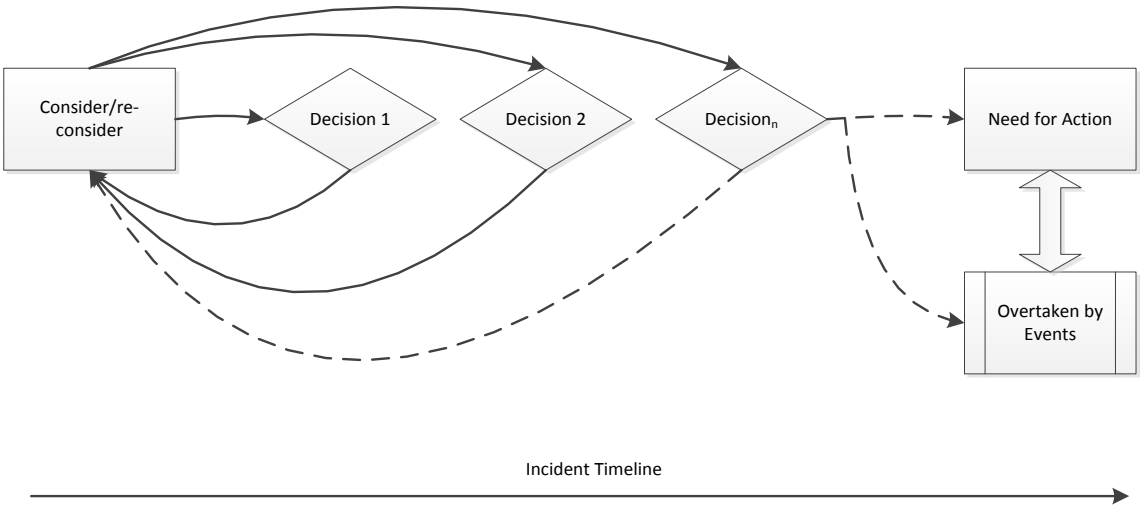


Figure 22 - Indecision (source author)

Indecisive commanders tend to bounce from one decision to another so it is not the case that they fail to make a decision it is simply that they make heuristic decisions and fail to stick to them, resulting in a lack of a clear direction of travel, and confusion among their team.

Soman (2004) cites an example of an individual who is faced with two options of equal value, decides on one then immediately the decision is made begins to re-evaluate the other option which then appears more attractive; the *Dithering Effect*. In an MME dithering, given the dynamic nature of the situation, can result in *any* opportunities for action being overtaken by events (Adair, 2011) or missed.

6.4 Principle 3 Consult with Others

Even in the most urgent of situations, consultation, however brief, should still be possible. This may be face-to-face with colleagues or over the telephone. Invariably an initial consultation will be with the person who informs the commander of the emergency; at this initial point the opportunity should not be lost to seek views. It may not be possible to discuss options for action but is should be possible to reach an assessment on the first steps. I have witnessed commanders who appear to take on the information they have been given but fail to appreciate what they are actually being told – including any advice they are being offered. In Case Study #1 (Chapter 4) the commander did not seek or take any advice and did not seriously consult at any stage of the incident. He maintained this attitude throughout the six days of the emergency. However, the reluctance of anyone within his team to offer advice did not help; it is likely that they knew he was unlikely to accept it anyway. It is unfortunate that it was only after the incident, and during the extensive inquiries and legal action, did members of his team decide to criticise the commander's actions.

Consultation is in my view a helpful part of the commander's armoury. However, it should be treated with care. Epley (2004) in his discussion of Anchoring as accessibility, and anchoring as adjustment, cites Koehler and Harvey's contention (2004) that assessments of others' perceptions are unduly tied to our own (Kenny & DePaulo, 1993; Keysay & Barr, 2002). The inference is to take care to listen to what others have to say and not simply seek out views that are similar to your own. If time is available before selecting options for action at the outset, or during an MME, consultation is a wise move providing the commander remembers that it is his/her ultimate decision that must hold sway. As Epley (2004) and others (Koehler & Harvey,

2004, Kenny & DePaulo, 1993, Keysay & Barr, 2002) contend, consultation is fine as long as the commander does not just listen to his/her own views being repeated back; it is essential to encourage and actually listen to what others have to say, no matter how experienced or inexperienced they may be. If care is not taken the result may not be consultation at all but simply a reaffirmation of what the commander has already decided. Any synergy arising from the team or group is not therefore necessarily helpful in deciding on actions. Hogarth (1987) raises the matter of selectivity, where people tend to seek information that confirms their own views. Commanders must also be aware, therefore, that the opinions and views being offered may in themselves hold a personal bias It is worth mentioning here that the proximity of the team to the command centre can be important and to have a team spread geographically may not help when a commander wishes to consult.

Janis (1982) characterised poor group thinking as groupthink (from George Orwell's 1984) and characterised them into three types or major causes of groupthink, repeated here for ease of reference:

"Type I: Overestimations of the group — its power and morality

1. *Illusions of invulnerability creating excessive optimism and encouraging risk taking.*
2. *Unquestioned belief in the morality of the group, causing members to ignore the consequences of their actions.*

Type II: Closed-mindedness

1. *Rationalizing warnings that might challenge the group's assumptions.*
2. *Stereotyping those who are opposed to the group as weak, evil, biased, spiteful, impotent, or stupid.*

Type III: Pressures toward uniformity

1. *Self-censorship of ideas that deviate from the apparent group consensus.*
2. *Illusions of unanimity among group members, silence is viewed as agreement.*
3. *Direct pressure to conform placed on any member who questions the group, couched in terms of "disloyalty"*

4. *Mindguards - self-appointed members who shield the group from dissenting information."*

Of the three, I have experienced Type III.3 and III.4. If the Commander is a controlling individual there could be an illusion of uniformity (Type III, 4) as the subordinate may not want to challenge him or her (could be said to be indirect pressure), and this could be developed into direct pressure on dissenters (Type III, 3). Baron's (2000) conclusion on groupthink is that we tend to be bias toward our initial ideas. I have come across this situation on many occasions when the commander has already made up his mind and creates the illusion of seeking group views whilst continually attempting to convince them to agree with his decision; each view expressed is usually countered by, *"well, that may be the case but…".*When opposing views to those of the commander are expressed during such consultation there are those who reject the views in support of the commander whether or not they agree with the dissenters; the reasons for this may be complex but may simply be a desire to curry favour with the boss. Figure 23 contrasts the illusionary consultation process with an open process. The illusionary consultation process identifies Mindguards (Janis, 1982) as the barrier to an open or legitimate consultation process to ensure that the commander's views prevail. In contrast, in the open process the commander openly engages with team members discussing options. Ultimately the commander decides on the action to be taken; one based on an open consultation with his team, and the other consistent with only the commander's views as supported by his Mindguards. Following the decision flow as set out in Figure 7 (Chapter 4) and adapted in Figure 24 later in this Chapter, the option decided upon is predicated in terms of its potential outcome. However, in cases were the illusionary consultation path has been taken it is doubtful that any prediction of outcome is actually undertaken as the type of commander who adopts this illusionary approach will consider his/her option as being the only legitimate course of action (Chapter 4, Case Study #1).

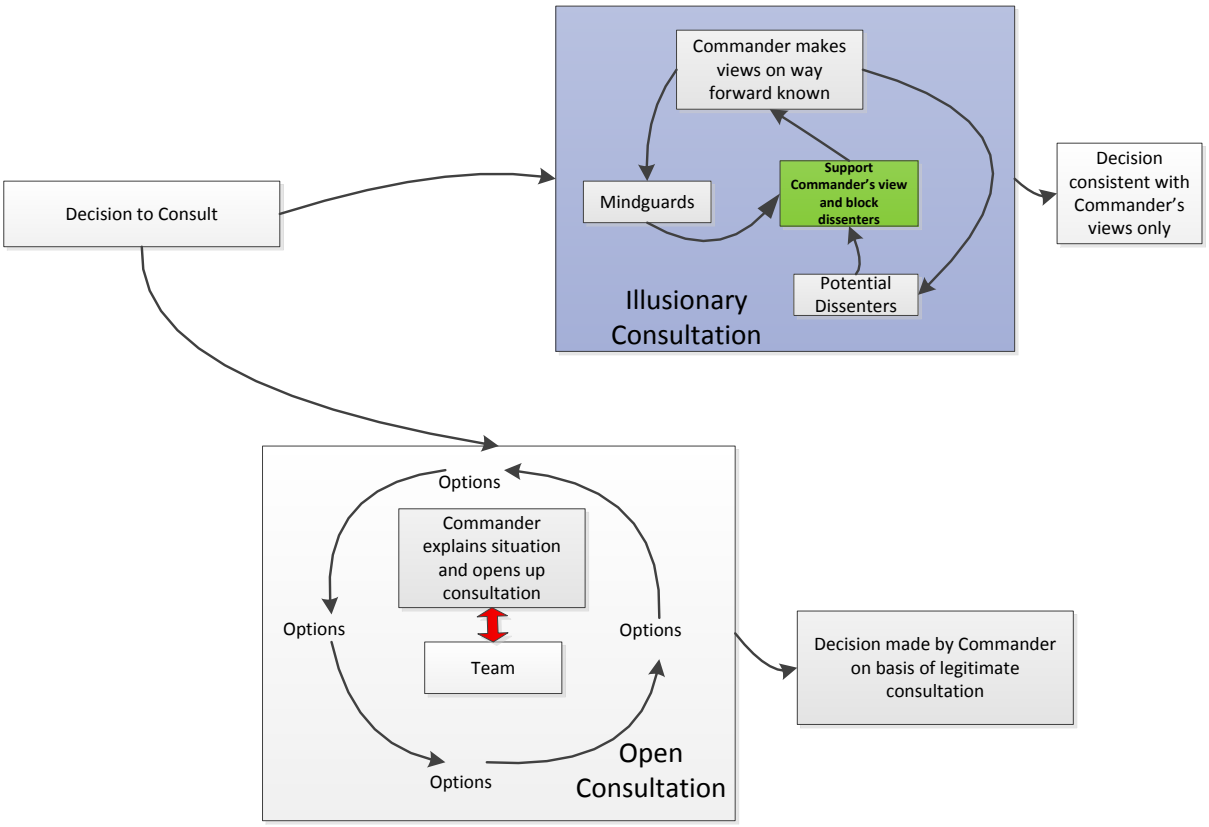


Figure 23 - Illusionary and Open Consultation Processes (source author)

Interestingly the illusion of consultation can include elements of P3 indecisiveness. Charan (2006) cites the case of a CEO chairing a meeting at which a new project was proposed for his company. The proposer presented the project but the assembled company waited for the CEO to comment. After a few questions from the CEO it became clear that he (the CEO) supported the project. Only then did the rest of the meeting decide to comment – all in support of the project. However, some of the more senior attendees at the meeting had serious misgivings but did not voice them and over time the project become, as Charan (2006) puts it, 'strangled' through indecision by those who did not agree with the CEO initially but failed to contribute honestly when the project was presented. I suspect that cases like these are a mixture of Mindguard influence (Janis, 1982) and fear of rejection by the CEO with potential damage to their career prospects. Given the reaction to the outcome of Case Study #1 (Chapter 4) by some

of the senior officials involved, this may have prevailed when the commander made his initial decision and only criticised him following post-incident evaluation and legal proceedings.

6.5 Principle 4 Learn to Fail

It is clear from Case Study #1 (Chapter 4) that once the initial decision had been taken by the commander he was not going to change his mind, regardless of the weight of evidence to the contrary. This was not an example of indecision or dithering it was simply a case of, in my view, a knee jerk decision that his arrogance would not allow him to change. In this case the commander did not *learn to fail* and continued to commit to his initial decision even when it appeared obvious to everyone around him that his decision and the option he had chosen was wrong (Schwenk, 1984 and Brockner *et al*. 1986), although they did not challenge him. The situation may have been an example of what I call illusionary consultation as described by Figure 23. One should pose the question, what would have been the outcome if the commander had been proved right and the situation had *not* developed into a full blown environmental disaster? Would his obstinacy have been praised and would he have been lauded as a strong leader? This of course is possible, however, he did not court challenge (probably through his reputation and attitude) and did not allow open consultation, so he was not actually flying in the face of presented evidence and showing tenacity in the face of adversity because for the most part he refused to allow the entire weight of evidence. From all the evidence I have reviewed the commander was not in 'listening mode' and did not balance all the arguments for and against his original decision. The initial decision was made in a few minutes without any real evaluation of information that was available, and he simply wanted the emergency 'out of sight and out of mind', and away from his jurisdiction trusting to the elements to resolve the matter. I would not therefore put his actions in the category of a strong leader knowing his mind. I am still unsure however as to whether the commander was obstinate or whether the lack of any real challenge gave him confidence in his decision. In my career as a UK Ministry of Defence (MOD) project review team leader I have come across several examples of obstinacy and a failure to listen. I call to mind *Project Hyperion* in 2010 (Army HQ web site) involving the move of UK Army HQ from Salisbury to Andover. In their book Engaging Change, Wilcox and Jenkins (2015) refer to the project as an example of leaders not listening and as a result they fail. Wilcox and Jenkins (2015) cite a senior officer, at a conference to discuss the project, who, among those of similar rank, considered himself *primus inter pares,* the first among equals, and as such the *de facto* leader. The lack of engagement and obstinacy of the individual and the lack of

challenge from his 'equals' resulted in a near total breakdown in the delivery of a coherent message about how the new HQ should look and feel. In their piece on *Project Hyperion* Wilcox and Jenkins (2015) conclude that "*leadership behaviour is everything, rhetoric counts for nothing".* I am glad to say that despite this, the move took place and the Army HQ is now firmly established in Andover. An example of, what may be considered to be, obstinate behaviour *par excellence* was provided in Margaret Thatcher's famous 1980 speech to the Conservative Party Conference about sticking to tough economic policies, in which she coined the phrase, "*You turn if you want to. The lady's not for turning".* At the time, the media was expecting a government U-turn on the issue. In this case her obstinacy is said by many to have paid off. In essence, it appears to be the outcome of an 'obstinate' decision that dictates the way history sees it. Perhaps there is another principle emerging here concerning perseverance under pressure that a commander could usefully apply providing that he or she has 'listened' to the best available advice and not simply steam-rolled his or her knee-jerk decision, avoiding all or any challenge.

People - Command
Persevere - If a consultation process has been undertaken and, following the appraisal of all available advice, and a decision has been made, see it through, unless and until a further comprehensive consultation and appraisal strongly suggests otherwise.

In stark contrast to Case Study #1 (Chapter 4), Case Study #2 (Chapter 4) involved frequent and carefully considered modifications to the originally chosen options by both French and UK Authorities when it was realised that initial and subsequent options were not viable. Indeed I would argue that the decision to hand over command to the UK by the French (a combined Anglo-French decision) was a courageous one, and introduced a new direction for the emergency. The French authorities could have insisted on retaining command of the emergency and not handed it over to the UK or, among other options, attempts could have been made to take her into a French port. It cannot be known absolutely what the outcome of these other options would have been but it is clear that the one chosen, albeit considered by many at the time, a risky one, proved to be effective. Similarly, in Case Study #4 (Chapter 4) options were taken, monitored and re-evaluated then discounted as not viable until an effective solution was found. The emergency in Case Study #3 (Chapter 4) failed through lack or organisational structure and a disjointed and fragmented command focus.

Virine and Trumper (2008), and earlier Arkes and Blumer, (1985) discussing project management, describe continuing with a project when you find a cheaper alternative, even if you have already spent a vast amount of money. They cite an experiment involving students being invited to make a decision about a computer project that cost $900k and was 90% complete. With added investment ($100k) an off-the-shelf solution could actually be better. 85% of students chose to continue with the current direction. When not told the costs incurred so far, only 17% chose to continue with the original bespoke project. They called this the *sunk-cost effect* (throwing good money after bad) or as I would call it in emergency management terms, *"command investment effect"*, which is linked to groupthink (Janis, 1982). A classic example of this type of reluctance is that cited by Williams (1986) as the *Concorde fallacy*, involving the joint Anglo-French supersonic aircraft Concorde. The British and French governments continued to fund the project even when it became obvious that it would not be profitable. Staw (1976) calls this situation an *escalation* when decision makers continue to follow a course of action that has already proven to be inappropriate or unsatisfactory. Plous (1993) cites a behavioural trap that occurs when managers become involved in rational activity that later becomes undesirable and is difficult to extricate yourself from. It is essential during an MME that commanders are open to options that will reverse or substantially change their current direction of travel. This of course takes courage and is not necessarily an attribute prevalent among many commanders, particularly when pressures to meet deadlines are an issue and personal credibility is at stake.

Koehler and Harvey (2004) refer to the reluctance to change direction also as the *Sunk Effect*– once a great deal of investment (financial and personal) has been *sunk* into a project a reversal of direction is unlikely. Clearly, this effect is not confined to projects or economic issues and is an issue that affects the implementation of the C4 framework in MMEs. The decision process described in Case Study #1 (Chapter 4) as set out in the Spanish National Contingency Plan (NCP), is an iterative process, as are many decision making models found in numerous texts on decision making, and requires at some stage a re-evaluation of decisions that have been taken and their consequences. In my experience re-evaluation can involve modifying the original decision and not necessarily a wholesale change of direction. This approach can be seriously flawed if the direction of travel is significantly wrong. Commanders need to adopt a more critical approach to the decision process. In the model described by Alberts and Hayes (2006) and shown as Figure 8 (Chapter 4) in this study, I would add an additional step as shown in Figure 24 (including Figure 21 consultation options). Whilst developing alternatives no doubt

includes the possibility of completely changing direction, it would be helpful to remind commanders that in addition to modifying the initial approach a complete re-think should also be considered.

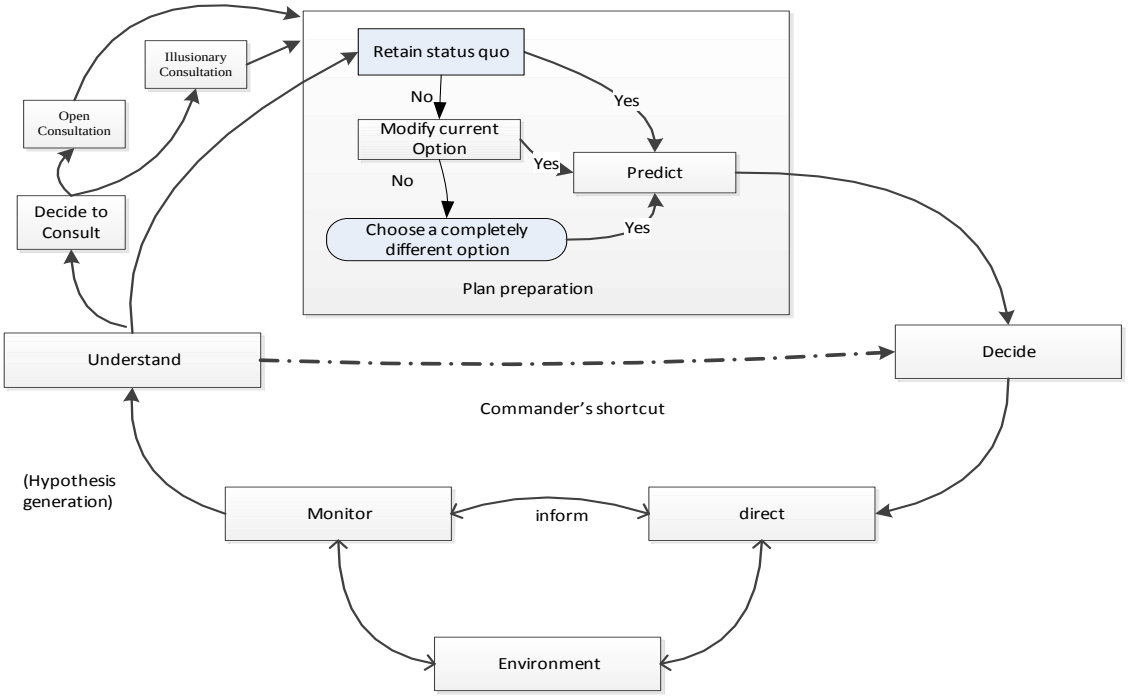


Figure 24 - Adapted HEAT Model (after Hayes *et al.* 2006, 1983)

Schwenk (1984) and Brocker *et al.* refer to the reluctance of decision makers to change their minds as *commitment* or *escalating commitment;* once decision makers make a commitment to a course of action they may consistently stick to it even when facts later appear that suggest the original decision was a bad choice. Schwenk (1984), Das and Teng (1999) and Kahle and White (2004) refer to a *prior hypothesis bias* as a condition where individuals form false hypothesis and make poor decisions on this basis, regardless of the abundance of evidence to the contrary. For example, in Case Study #1 (Chapter 4) the commander had formed a hypothesis that if the ship was taken out to sea in a storm it would sink, and as a consequence its cargo of oil would disperse within the water column (at significant depth). Had he listened to the information and

advice being provided by international experts on oil dispersal he would have appreciated that his hypothesis was incorrect – as it was proved to be.

6.6 Principle 5: Avoid Prescriptive Plans

I have referred to the potentially erroneous nature of pre-planning elsewhere in this study (Chapter 5) and expressed the view that is common within military circles, that a plan seldom survives first contact with the enemy (Barnett, 1963) – in this case an MME. I have come across some very brief 'plans' that comprise a simple contact list of resources and other plans that comprise a whole range of possible scenarios from which the commander may choose and adapt accordingly. This latter approach was common in the offshore oil and gas industry in the 1980s and resulted in volumes of plans that could not easily be accessed or understood; in some cases the ring binders would pop open leaving hundreds of out-of-sequence pages on the operations room floor. Eventually an 'all hazards' approach was adopted which produced plans that comprised roles and responsibilities of stakeholders and contact details, but not potential scenarios. The rationale was simply to get the right people to respond and to enable the emergency to be dealt with in a non-prescriptive way, dealing with situations as they arose. This is a more improved philosophy for emergency planning but, like many well-meaning initiatives, it falls foul of mission creep. There are many definitions of mission creep, but the one I particularly like is (FTL, 2015):

> "*A series of gradual changes in the aim of the people who manage a company or organization, with the result that they do something different from what they planned to do at the beginning".*

Eventually some 'all hazard' plans became 'every hazard' plans.

In my experience, plans tend not to be referred to at the outset of an emergency unless a telephone number or other contact detail is required for an important resource. However, with the advance of communications technology these uses are becoming less likely, with the result that such plans are usually confined to the operations room shelf. For example, when the Spanish NCP incident occurred in 2002 (Chapter 4, Case Study #1), the plan was not used at all by the commander, nor had it been updated since it was written in 1990. However, I recall that during my expert witness evidence (2013) that the commander's lawyers attempted to convince

me that he had taken it into careful consideration but a wealth of evidence contradicted their assertion.

The UK Coastguard has made efforts to make emergency and other procedures available electronically and much easier to access (OMS, 2010) but this approach is, in my opinion, seldom used and the reliance on paper copies much more common. Plans tend to be comfort blankets for audit purposes in most cases and are often only referred to after an event to justify or otherwise the actions taken by the commander. Plans also tend to comprise long lists of actions that are seldom consulted, and sometimes result in commanders attempting to commit such lists to memory to avoid having to consult them and look unprofessional. Frensch (1994) and Healy *et al.* (2000) consider lists and the ability of people to recall them, and conclude that items at the beginning of the list are the easiest to recall, followed by the items near the end of the list. They found that items in the middle of the list are the least likely to be remembered. They call this observation the *Series Position Effect.*

When drafting a plan, regardless of its approach and composition, planners mostly call upon past events as a guide, and this can be misleading. Mitchell and Thompson (1994) and Golden (1997) refer to *'rosy retrospection'* when discussing the influence of past events, and make the point that there is a tendency to rate past events more positively than they actually were at the time. If this is true, the question has to be asked: can we believe history, particularly when management gurus cite famous figures of the past as exemplars of decision making and guides to modern practice? For example, Kets de Vries (2014) in his review of Alexander the Great's 11 leadership lessons considers that Alexander was a rare individual but that in general the 'Great Man' theory of leadership *"belongs to the scrapheap of history".* The Big Question Team of the Open University (OU website 2004) asked whether we could believe history and also asked whether history can ever be objective or even accurate. The Team heard from a wide variety of contributors from around the globe, many in prominent positions. Some contributors, June Bam for example, the then (2004) Chief Executive of the South African History Project, said that "*history books that are plain wrong can do huge psychological damage".* Can we therefore believe history as it relates to major figures when it comes to their leadership and decision making abilities or talent? Are the 11 leadership principles cited by Kets de Vries (2014) actually those of Alexander the Great or embroideries and enhanced interpretations over time? The historians of the Former Yugoslav Republic of Macedonia (FYRoM) make the claim that

Alexander along with other Macedonians used their own native language which was different from the Greek language. They make the claim that

"linguistic science has at its disposal a very limited quantity of Macedonian words".

The campaigns of Alexander were contemporaneously chronicled by Callisthenes, Alexander's campaign historian, presumably in native Macedonian. However, a more influential work is said to be documented by Cleitarchus, who was not actually present during Alexander's expeditions but used published sources (Green, 2007). It is also interesting to note that in 2011 it is alleged that FYRoM historian Professor Peter Popousku was less than truthful about the ancient history of Macedonia and was accused of lying and manipulating facts (YouTube, 2011). I am not disputing the leadership principles of Alexander simply pointing out that over time history can be somewhat distorted and potentially unreliable. I have experienced this myself with the media – can we believe everything we read in the newspapers? I believe that the truth about the leadership prowess of Alexander is somewhere between fact and fiction, depending upon the nature of records (contemporaneous or not), the length of time that has passed, and the author of the history. For my part I tend to treat any plan based upon past events with caution. An example that comes to mind is the writing of coastguard incident reports several days or weeks after the event. It was often said that the author of the report wrote the narrative to reflect the way they wished the emergency had progressed, rather than the way it did. I have found generally that people are not in the business of criticising themselves. If someone were to retrieve the many documents about past coastguard incidents and write a history based upon them I am not sure that it would reflect the whole truth and the historical flow would probably 'fit where it touched'.

6.7 Principle 6: Grasp Opportunities for Experience

Hogarth (1987) makes the point that most decisions are made intuitively regardless of the variety of approaches that can be adopted. Hogarth (1987) departs from the usual decision making models and takes the view that almost all decisions are based on intuition which, he says, are based upon predictive judgements about the future. I must confess that during my career I never actually studied any formal command approach or decision making model other than the simple process gained through practice and experience that I have outlined within this study. It is perhaps only through this study that I have appreciated that my decisions in emergency management have in the majority, if not all cases, been intuitive. As a one-time

musician, It brings to mind an anecdote about the famous American banjo player Earl Scruggs who, when asked if he could read music, allegedly replied *"not so much that it interferes with my playing".* Scruggs also said he couldn't understand how anyone could play the same tune twice in exactly the same way – he could have been talking about MME decision making – no two emergencies are the same however similar they may appear at the outset. Hogarth (1987) goes on to contend that intuition accounts for almost all real decision-making activity, but argues that intuition can be both studied and educated. Clearly, without knowing it, I have matched Hogarth's conclusion through my own career.

The guru of advertising David Ogilvy (1983) considered that *"stuffing your conscious mind with information"* would subsequently store the information in your unconscious which could be released when later seeking ideas. He contended that without this 'mind stuffing' as a way of ensuring that the unconscious is well-informed, and that any ideas that come from the unconscious are not irrelevant or unrelated to the topic at hand. Clearly when faced with a difficult decision during an MME the more informed you are consciously and subconsciously the more likely you are to make a well-informed decision. In my view this can only be brought about by being well-informed in the field of maritime operations through continued exposure to emergency situations.

'Intuitively', I have sought out as many strategic, tactical and operational experiences as possible throughout my career and believe they have built my intuitive base and aided my heuristic responses in the initial stages of an MME. I have met those who avoid difficult operational circumstances and they are the worse for it. Indeed I have witnessed senior officers actually leave an operational environment when situations become difficult for fear they may be asked to make a decision or contribute to one. Hogarth (1987) believes that intuition can be developed through training and practice. I agree and believe that the more exposure commanders, and potential commanders, have to real emergencies, or indeed simulated emergencies in training, the more likely they are to make the most effective choices when faced with difficult decisions under pressure. There is no guarantee of course, but I believe that such an approach gives the commander a better chance of success.

The lack of any guarantee brings with it inherent dangers in relying on intuition, particularly if it brings repeated success. Gamblers fall foul of this tendency when they assume that the chance of future bets is governed to a large extent on their previous successes, even though each event

is random. Of course, the random events of a gambler are not those associated with a commander's intuition but intuition could develop into a trend of infallibility or 'God Complex' (web site of Analytical Psychology and Psychoanalysis, 2011) and result in dangerous decisions. This is also true of gamblers and the gambler's fallacy (Sage, 1981 and Terrell, 1984). In such cases there is an absolute belief that they are right and those who attempt to advise them to the contrary with logical argument are wrong. Thus gamblers immerse themselves in absolute self-belief to the detriment of all else.

6.8 The Psychology of Decision Making, and Decision Making Errors in Non-Maritime Fields

In the above sections I have appraised cognitive decision making studies, primarily as they apply to maritime emergencies. Indeed, throughout this study I have focused primarily on the maritime industry and only touched upon human error for the implementation of the C4 framework and similar constructs in non-maritime fields, for example, cross-cockpit gradient in the aviation industry (Chapter 5, (Last, 1999)) and medical student selection (Chapter 3). Rather than undertaking a conventional literature review of the voluminous material on decision making (for example, on naturalistic decision making and sensemaking), the approach I have taken is to review expert analyses of specific categories of emergencies in several fields complementary to the maritime field, and to draw out implications for my current set of principles. The fields I have chosen are, nuclear, aviation, rail, industrial, and medical.

6.8.1 Nuclear Industry

Reason (2013), discusses the **Three Mile Island nuclear accident** (1979), in which a power station operator did not recognize that a relief valve on the pressurizer was stuck open and assumed that the valve was working correctly; the mechanism had actually failed resulting in a partial nuclear meltdown. He went on to describe the errors that occurred as "*arising from an inappropriate diagnostic rule".* Reason (2013) understands that the rule had been reliable up until the time of the accident but at a crucial time had given wrong answers. Investigators put the accident down to lack of training and human error. In its report into the accident, the US Nuclear Regulatory Commission (NRC) (Rogovin *et al*. 1980) made the point that the, then, regulatory framework neglected operator training and plant operating procedures, and recommended that this be put right. In discussing the designs of the plant, Stephen Hanauer (a leading expert in safety design) is cited in the report (Rogovin *et al*. 1980) as sending a

memorandum to the NRC Commissioner Victor Gilinsky in 1975 saying *"Present designs do not make adequate provision for limitations of people."* Reason (2013) says the accident involved "*an incorrect appraisal of the system state",* and refers to Rasmussen's (1983) three performance levels: skill-based (SB), rule-based (RB) and knowledge-based (KB). Using this framework, Reason (2013) distinguished three distinct error types involving **skills, rules and knowledge.** I apply this approach in an attempt to interpret several of the accidents I discuss in this section and will refer to it as the Reason-Rasmussen model. The SB error in the Three Mile Island accident involved routine or habitual activity that was almost subconsciously carried out. Checking switches and indicators did not, in this case, require much, if any, thinking on the part of the operator. I will not go into the technical detail of the nuclear plant's *modus operandi* as it is readily available to those who wish to read it (Rogovin *et al*. 1980), but suffice it to say that the operators (and supervisors) saw and believed what they wanted to believe from valve indicator lights, and refused to accept ominous readings from other reactor instruments. As the NRC report (Rogovin *et al*. 1980) says, they elected *"…to be misled by this bearer of what they perceived to be good tidings".* Clearly, no one likes bad news but the outcome of their refusal to recognise a problem was catastrophic. There are examples of this attitude elsewhere in my Case Studies (particularly, Case Study #1), and the appraisal of cognitive decision making studies (earlier in this Chapter). I feel that learning to fail (P4) is an issue here because someone felt that something wasn't quite right, but didn't say anything and consequently went along with the flow (the 'flow' being the habitual routine). Perhaps principle P3 (consultation - but illusionary, see Figure 23 earlier in this chapter) also applied. It could also be said that the rules as they applied at the time of the accident did not cover the situation that arose; Principle P5, about pre-determined scenario-driven plans, could also apply here. Using pre-determined scenarios can confine a commander within a restricted thinking space and tend to leave him/her in the RB mode and unable to move on to the KB space.

Reason (2013) discusses Rasmussen's (1980) three-tier performance level RB in the context of the accident and considers, much as I do, that rules may be useful, as long as they work, but KB and the ability to think on one's feet when rules break down is essential. In the case of Three Mile Island, all three of Rasmussen's (1980) tiers applied, as operators failed to think on their feet, or simply could not, because they were unable to consider matters beyond the 'rules'. Recall also my earlier comments about rosy retrospection (Mitchell and Thompson (1994) and Golden (1997) and the influence of past events on our view of the future; just because it's worked in the past, is no guarantee it will work in the future. In an article for the *First10EM*

Journal about cognitive errors in medicine, Morgenstern (2016) refers, among other cognitive biases, to *affective error*, when an individual can convince themselves of what they want to be true. The bias can be prevalent in an A&E department when a doctor or nurse bases a diagnosis on previous cases, resulting in mis-diagnosis, for example, diagnosing viral gastroenteritis and missing meningitis with fatal consequences (The Guardian, 2013). One of the doctors involved in this misdiagnosis admitted later that "*Personally he had never seen a case like this before",* and said with hindsight he would have sought further advice (Neal *et al*. 2012, Roese & Voh, 2013). The Three Mile Island accident, also reflects *confirmatory bias* (Evans, 1989) – the operators and supervisors remained convinced that the instruments confirmed what they usually believed to be true and did not consider any alternatives.

Helander (2006) cites confirmatory bias in relation to the Three Mile Island accident, and gives three reasons for it, which are worth repeating here:

> *"1. People have cognitive difficulties in dealing with negative information.*
>
> *2. To change a hypothesis requires effort.*
>
> *3. The final formulation of the decision becomes a self-fulfilling prophecy. We start off with a cautious attitude and keep building up the confirming evidence".*

My principle P3 (consultation) and the involvement of Mindguards (Janis 1982) in any consultation process is relevant. Consultation can quickly become illusionary (Figure 23) is those involved avoid dealing with information that is contrary to what they believe, and as such is 'negative' to them. The outcome of Case Study #1 (Chapter 4) resulted from adherence to a hypothesis (the ship would sink far off shore and all pollution would sink with her) that was fatally flawed.

6.8.2 Aviation

The world's deadliest mid-air collision occurred in 1996 resulting in the deaths of 349 people. The **Saudi Arabian (SA) Flight 763** was given an instruction by the Air Traffic Control Centre (ATC) to remain at its current height, but instead reduced its height twice and collided with Kazakhstan Airlines (KA) Flight 1907 flying at the lower altitude (Aviation Safety Network, 1996). Accident investigators surmised that the pilot of the SA flight reduced altitude to avoid turbulence, but this is not known for certain. What is clear is that the pilot ignored the

instructions of the ATC. It can only be imagined what was going through his mind prior to the collision; was there some form of bias in operation, for example, ego or superiority bias with the pilot considering he 'knew best'? Could cross-cockpit gradient have been an issue (Last, 1999)? Turning to the three levels of behaviour as expounded by Rasmussen (1980) and discussed by Reason (2013), it could be that the pilot was in an SB condition as he was piloting his aircraft after take-off, his mind in habitual mode. The weather conditions may have moved him on to an RB condition and as he realised the collision was imminent, a KB situation may have prevailed, but whatever knowledge he applied it would have been too late. I cannot know for sure that any transition through these levels occurred but it is a reasonable assumption. Perhaps significant to the pilot's actions is the black box cockpit recordings and the exchange of communication between the radio officer and pilot which had been translated from English into Arabic. The level of English on the flight deck was said to be poor. This could have resulted in misinformation being passed to the pilot.

Situations such as the one just described happen regularly at sea and potential collisions are avoided by visual contact; with ships moving relatively slowly this is mostly always possible. In the aviation world if misinterpretation occurs in similar circumstances it is almost impossible to avoid a collision given the speed of approach. My Case Study #1 (Chapter 4) includes an example of poor communication between the commander of the emergency and the captain of the ship involved – ultimately resulting in the captain being arrested for refusing to obey the commander's orders. In truth the captain was unaware that any order had been given due to the misinterpretation of Greek and Spanish translations into broken English. I have included several principles that address this issue (P13, P14, and P15). Training and simulated exercises can help avoid such situations, particularly with the use of an appropriate translator, i.e. one that understands the context of the emergency; a translator that understands, for example, maritime nomenclature.

In considering human information processing and breaking down its traditional components, Helander (2201), cites the Card, Moran and Newell (1983) three processor model. The three processors are: perpetual (to see and hear); cognitive (to think); and, motor (to act), and rely upon information being fed into the perpetual processor. In the case of Flight 763, what the pilot was, for whatever reason, seeing and hearing was not the true situation and his actions resulted in a disaster. It may indeed have been a communication failure but it may also have

been that the pilot thought he knew best and disregarded the ATC (a form of 'Beyond the Rules Narcissistic' behaviour (Caligor *et al*. 2015) or simple arrogance). Dunning and Kruger (1999) introduced the Dunning-Kruger Effect as a cognitive bias where relatively unskilled individuals suffer illusionary superiority. I am not suggesting that the pilot in this case was unskilled in terms of piloting, but he would not have been skilled in ATC even though he could fly an airliner – they are two different skill sets. Ignoring the ATC may have resulted from his 'illusionary superiority' and belief that he knew better that those on the ground in the ATC. I have witnessed this situation in maritime traffic separation systems (TSS), where the shore-based operator of the TSS advised a ship to take a particular course of action to avoid a collision and it was ignored only for the ship to have to take collision avoidance action a short time later. In such cases, those in command assume they have all information to hand to make a decision and ignore those who really do. My principle P3 is essential for commanders. The pilot of Flight 763 had plenty of time to consult and to take advice but, like the commander in Case Study#1, he did not take advantage of it. I raise the issue of illusionary superiority again in my discussion of an industrial building accident.

Decision errors can be at the heart of accidents. Lipshitz (1997), defined decision errors as:

> *"Deviations from some standard decision process that increase the likelihood of bad outcomes"*.

Woods *et al.* (1994, pp. 59), in the context of decision modelling, contends that:

> "*The only way to test one's decision is to judge the response from the environment".*

This of course is true; one can never know the real consequences of a decision until it is acted upon. Learning to fail (my P4) is, however, an important quality for a commander because, as Woods *et al*. (1994) put it, if the *environment* rejects the decision, it is essential that an alternative path is taken. Sadly, in many aviation accidents in particular, there is no second chance. I have often thought that decisions themselves can be relatively straightforward, but it is the consequences that can prove difficult to deal with.

In stark contrast to the Saudi Arabian (SA) Flight 763 and Kazakhstan Airlines (KA) Flight 1907 mid-air collision, and a positive demonstration of the SA, RB to KB transition, was the landing on the Hudson River of **American Airlines Flight 1549** in January 2009 (NTSB, 2009). The flight suffered a severe bird strike disabling both the aircraft's engines shortly after take-off from La

Guardia. The crew doubtless went through the checks and take-off procedure they had done hundreds of times before and were likely at Rasmussen's RB level. When in the air, the situation doubtless relaxed to the SB level, but once the bird strike hit, the captain and crew went through the procedures to deal with such emergencies – at the RB level. (See NTSB, 2009, Section 1.17.1.2.1 Part 1 of the Engine Dual Failure Checklist.) When the captain realised the full extent of the emergency and the need for an extremely complex and hazardous landing, it was his experience and knowledge – at the KB level – that kicked in and enabled him to carry off, what has been termed a miraculous landing on the river Hudson, saving the lives of 150 people. Subsequent simulations of the ditching carried out using an Airbus test pilot, only managed one successful landing on water in 1 out of 12 attempts. However, the simulation could not repeat the real-world more hazardous situation experienced by the crew on that day. Whilst the 57 year-old captain was very experienced, and had sufficient knowledge to think on his feet, this was not something that all of his colleagues could do, even experienced test pilots. This raises the question: what singles him out from his colleagues? Figure 25 shows my interpretation of the basic events surrounding the take-off to ditching of Flight 763.

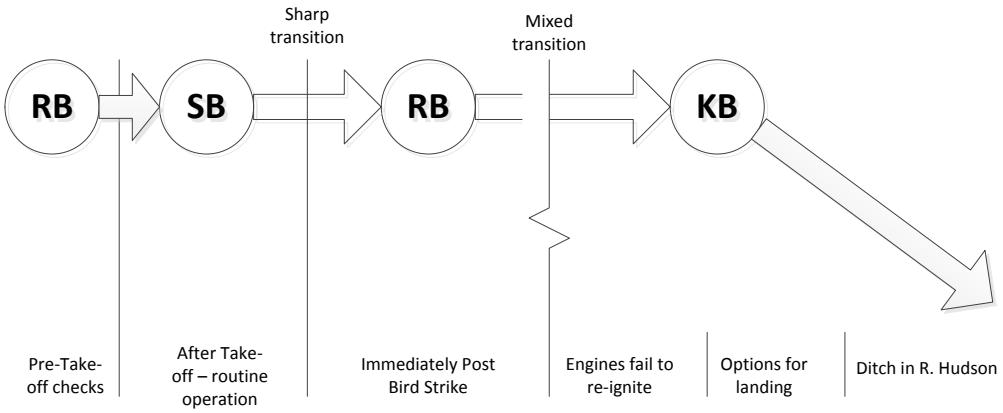


Figure 25 - The RB-SB-RB-KB levels for Flight 763 (source author)

The clues to the pilot's success, in my view, are his transitions through the SB, RB, KB levels, and the way he remained at each level only moving up as events dictated. It was not a smooth transition from RB to KB as RB was still being played out as KB was kicking in. This is indicated by the pilot switching on the Auxiliary Power Unit (APU) to ensure the aircraft had power for all essential services – this move did not feature in the checklist but was based on the pilot's

experience that if he ditched the APU would give power to the aircraft for the release of doors and slides. The RB level was triggered when the bird strike occurred with the use of the engine failure checklist, and the professional, often unspoken observational communication between the pilot and co-pilot. When the engines did not re-ignite by following the checklist (there was only time for the first page of three pages of the list to be considered), both pilots entered the KB level, considering options, based upon their extensive knowledge and experience, for landing. Ultimately ditching on the Hudson River was the only viable option. It is noteworthy that the time between the RB and KB levels is measured in seconds (circa 40-50 seconds).

The adherence to subconsciously following the three levels ensured that all options for action were considered. This, together with the obvious knowledge and skill of the pilot, resulted in all lives being saved. His actions were a complex combination of events. It may be that other pilots in similar circumstances would move more quickly from SB to KB and not enter the RB level at all. An extract from the NTSB Investigation (2009) is relevant:

> *"Both pilots indicated that CRM [crew resource management] was integral to the success of the accident flight. The first officer stated that they each had specific roles, knew what each other was [Sic] doing, and interacted when necessary. The captain indicated that, because of the time constraints, they could not discuss every part of the decision process; therefore, they had to listen to and observe each other. The captain further stated that they did not have time to consult all of the written guidance or complete the appropriate checklist, so he and the first officer had to work almost intuitively in a very close-knit fashion. For example, the captain stated that when he called for the QRH [quick reference book], about 17 seconds after the bird strike, the first officer already had the checklist out. The captain stated that the US Airways CRM and TEM [threat and error management] training, which was integrated into all aspects of US Airways training, including ground school and flight training, gave pilots the skills and tools needed to build a team quickly, open lines of communication, share common goals, and work together. CVR [cockpit voice recorder] data indicate that the communication and coordination between the captain and first officer were excellent and professional after the bird strike. Further, the flight crew managed the workload by making only pertinent callouts to ATC and the cabin crew as time permitted. In addition, CVR data showed that each pilot adhered to his role and responsibilities during the accident sequence. The first officer progressed through the checklist while the captain*

was flying the airplane, communicating with ATC [air traffic control], and determining a suitable landing point. In addition, the captain used the first officer as a resource by requesting his input during the accident sequence. The NTSB concludes that the professionalism of the flight crewmembers and their excellent CRM during the accident sequence contributed to their ability to maintain control of the airplane, configure it to the extent possible under the circumstances, and fly an approach that increased the survivability of the impact."

It occurs to me that the qualities of the pilot (and his co-pilot) played a significant part in this case. Their attitude to the emergency exhibited qualities that could have been assessed in advance of them being given command roles. I therefore make the important point here that my principles can not only be used for training purposes, but also for the selection of commanders. It is one thing to fly an aircraft, captain a ship, or perform life-saving surgery, but quite another to respond to an emergency and make the right decisions bringing all knowledge and experience to bear. Yates (1990) refers to *The Conflict Issue* and suggests that in all walks of life conflict decisions stare us in the face; taking decisions when balancing the pros and cons of the outcome is a feature of everyday life. The ability to take a decision that you know can have severe consequences but will still give one a chance of success takes courage and clear thought. The pilot of Flight 1549 was faced with a significant conflict; if he tried to make a crash landing on land, there could be severe collateral human casualties and environmental damage, not to mention the lives of his passengers. As an experienced pilot, he also knew that ditching his aircraft on the Hudson Riven brought with it high life risk. His experience and knowledge (KB mode) brought him to a very speedy conclusion that ditching was the best course of action. The pilot's actions endorse my principles P2 (don't dither) and P6 (gain experience). Without his extensive experience and his ability to see all options clearly to enable him to make a decision in a very short space of time, he would likely have made the wrong choice with disastrous consequences.

6.8.3 Rail

A lesser known event, classed as **a near miss** by the UK's Rail Accident Investigation Branch (RAIB), occurred in September 2014 (RAIB 08/2015) and involved a speeding train and nine track workers. The workers were repairing a section of track on a bend near Hest Bank in Lancaster (a town in the North of England) and were supposedly protected by a warning system of

approaching trains given by a lookout using a radio-based lookout operated warning system (LOWS). In the case of the near miss, the lookout failed to give the warning of an oncoming 98 mph train, but fortunately the workmen saw it in sufficient time to jump clear. The RAIB investigation report (RAIB 08/2015) concluded that the lookout may have inadvertently operated the wrong switch on the LOWS or he may have forgotten about the need to send a warning during an intended delay period between seeing the train and operating the warning switches. The error was put down to the lookout being on duty for two hours. Apparently, a previous recommendation by the RAIB following a similar event intended to mitigate such near misses, had not been implemented due to administrative errors. Following this most recent near miss the RAIB made two recommendations, one about the management of working time for tasks that require vigilance, and a second about the operation of the LOWS.

Helander (2006) discusses vigilance in the context of military radar operators and security guards, and draws upon various studies to analyse vigilance problems. In essence, there is a tendency for vigilance to drop off over time, particularly where the individual is isolated from co-workers (Helander, 2006, pp.92, Figure 5.9). Helander (2006) also refers to the design of equipment, and the benefits of simple controls. In this near-miss event, clearly having similar types of switch to perform separate and crucial functions was not helpful, and has since been revised. The design of equipment *per se* is not a feature of my study but the overall connectivity of the C4 framework model and the environment in which it operates is an important feature of its success. There are two issues linked to my principles here. The first is the need to keep the organisation under regular review as it applies to the C4 framework (Chapter 3, Figure 6) to ensure it remains fit for purpose, and capable. The second is the need for frequent and regular 'time-outs' within the command centre (P26) to avoid operators being isolated from the body of the emergency and from their colleagues; time-outs also help avoid operators remaining for lengthy periods in their positions and losing their vigilance. In many command centres communications personnel can be isolated through wearing a radio headset and focusing continually on a computer screen. In such cases the time-out process should be used to relieve or rotate these personnel.

If the lookout used the wrong switch it could have been an absent minded (AB) event as identified by Reason (2013), or it could have been that the lookout simply did not understand the procedure he was intended to operate; being on lookout for two hours may have been a factor, but in my experience having seen some trackside safety workers (those with the flags

and radios) during my regular travels, boredom could also have played a part. Cummins (2015) gives several examples of activities to relieve boredom that have deviated individuals from their intended roles, for example, air traffic controllers watching movies, and pilots playing on their laptops during long-haul flights. Leastwise, there were several factors at issue here in addition to the role of the lookout. One of these was the location in which he was placed by a supervisor, which was not the best place for him to be, given the bend in the track and the speed of the trains using it. Moreover, had the previous RAIB recommendation (RAIB 06/2011, para 98-103) been implemented, the near miss may not have happened. Overall, there may indeed have been a lookout error (the lookout wandering between the SB and RB levels), but there was also a governance issue within National Rail. It is perhaps surprising that the previous RAIB recommendation had not been followed up by the RAIB. In contrast, in my consultancy work with the MOD, when I complete a project review, report and recommendations, the MOD authority has to make an action plan and the action plan is followed up by the MOD Integrated Assurance Team to ensure that the recommendations are carried through.

A schematic of the Lancaster near miss is shown in Figure 26.

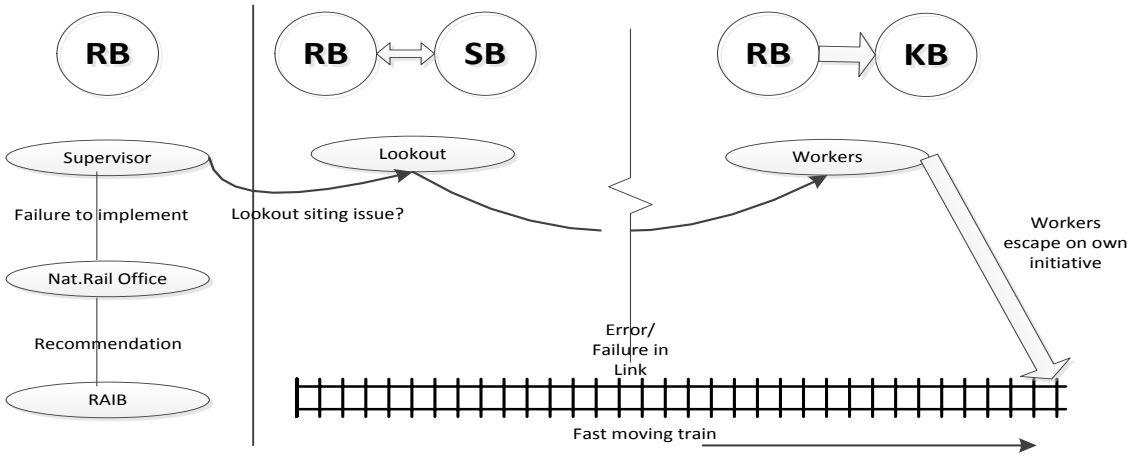


Figure 26 - Development of SB, RB, and KB in the Lancaster Rail Near Miss Incident (source author)

On the face of it, reading Figure 26 from left to right it has the features of Reason's Swiss Cheese model (2000), in that the sequence of events appear to have causal links. However, The

RAIB Report (08/2015) reported the sequence of events that led to the near miss and referred to them as *"underlying factors".* They concluded that the primary cause was the actions of the lookout and indicated that he switched the wrong switch (switches on the LOWS looked the same, Figure 27), and that his period of duty was too long for carrying out habitual and repetitive tasks (Reason, 1990) in a situation that required vigilance. It may be that if the lookout had been more knowledgeable about the overall process he was engaged in he would have overcome the issue of his location (possibly too far from the work site), understood the situation better, and moved beyond the RB level. Although the individual had been trained as a LOWS operator, and indeed as a supervisor for the equipment, he still managed to flick the wrong switch. Figure 27 shows a typical LOWS unit with warning activation switches on the left of the unit and the vigilance switch on the right. The vigilance switch is intended to advise workers to take care, whereas the warning switches activate alarms at the work site with the intention of having the workers move to the trackside.

Figure 27 - A Typical LOWS Unit (courtesy RAIB)

The lookout had apparently activated the vigilance switch dozens of times during his shift prior to the near miss and it is assumed that he activated this switch, and not the warning switch, without thinking; likely an Absent Minded (AM) slip (Reason, 1990, 2013); this is considered a possibility in the RAIB Report.

Baker and Malone (Karwowski, 2001) in discussing the classification of human error would refer to the near miss event as an *error of commission,* in that the lookout performed the tasks given

to him incorrectly. Among the detailed list of characteristics that Baker and Malone (Karwowski, 2001, p. 964) consider as influencing human error, I have identified four that may have applied to this event: fatigue; motivation; incorrect expectancy (expected vigilance and not warning); and boredom.

Pickup *et al.* (2014), refers to the reduction in vigilance as the *'vigilance decrement'* and describe it as the drop in a person's performance whilst monitoring tasks. They refer to studies (e.g. Mackworth, 1948, 1969) that have observed that this can occur within the first 15 minutes of being tasked and that the greatest decrement can occur after 30 minutes. Thereafter, the reduction in vigilance slows. However, since these early studies it has been recognised that the situation is more complex and subsequent studies (Deaton & Parasuraman, 1993) have introduced a *vigilance* taxonomy specifically for the railway lookout. I agree that the decrement in vigilance is dependent upon the type of task being carried out, and note here that in UK Coastguard command centres tasks such as monitoring radios for distress calls (with the operator wearing a headset) is usually limited to two hours. In my experience, when communications traffic becomes substantial and complex, the operator should be relieved more frequently. This is addressed in my 'time-out' principle (P26).

6.8.4 Industrial

In 2013, there was a **factory building collapse** in Bangladesh killing 1129 people and injuring 2500. It was said to be the deadliest accidental structural failure in modern human history (BBC News web site, May 2013). The investigation that followed this tragic loss of life showed that the building's owner had converted the building from commercial to industrial use without permission. (Specifically, he had built an extra 4 floors, again without a permit and, unbelievably, when warned the day before the tragedy to move his workers out because of cracks appearing in the building, he ordered them back in to carry on working. Overall, the tragedy was put down to a lack of good governance on behalf of the owner. Reason (2013) refers to errors that occur through *violations* as deliberate acts of people who set out to break the rules or to ignore them. Clearly, the owner of the factory deliberately broke the rules and ignored advice, although it is doubtful that he intended the consequences. Reason (2013) mentions motivational factors, which in this case were to keep the factory operating regardless of the risks to his workers and to continue to make a financial profit. He also makes the point that violations arise from organizational culture. It is doubtful that workers in western countries would have returned to the building in the same circumstances, whereas they did so given the

culture in Bangladesh, where labour is cheap and it is likely that any employer who fails to comply with the orders of the owner would be replaced swiftly with one who will. It may also be the case that the prevailing culture does not challenge the hierarchy. That said, there are examples in western culture where the bosses are not challenged (Chapter 4, Case study#1), but there may be other factors at issue in these cases.

Figure 27 shows my interpretation of the accident in terms of the Rasmussen-Reason Model, which separates the situation for the workers, and the owner. I have assumed that the workers, in their desire to keep their jobs, simply follow whatever they are told and are almost constantly in the SB mode. On the other hand, the owner at the point where he was appraised of the building regulations as they applied to his factory, was presumably in the RB state, but once he had decided to disregard the rules he lapsed into the SB mode of operation and carried on the way he had always done, with complete disregard to any rules and the condition of his workers. Had he taken account of the rules and considered the potential of disregarding them (the KB state) the accident would not have killed his workers.

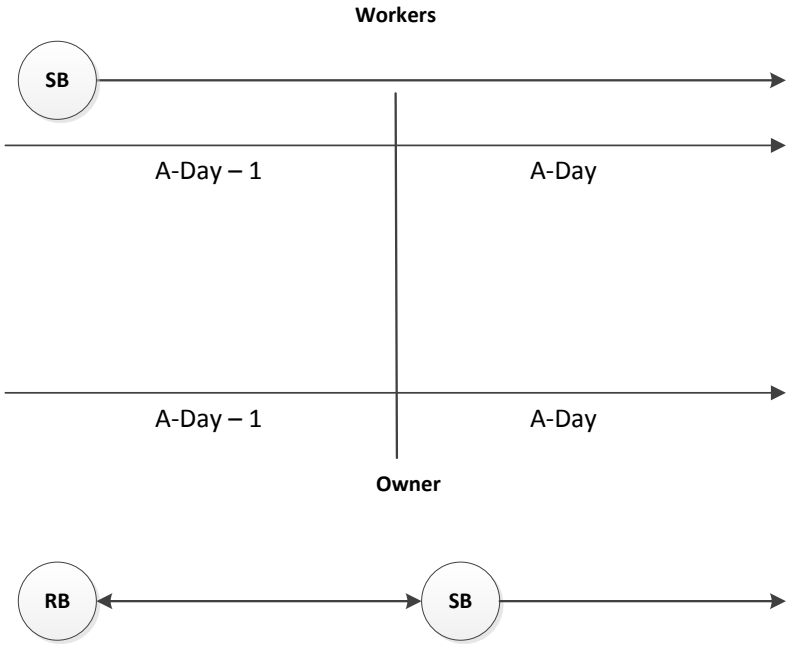


Figure 28 - Owner versus Workers RB-SB levels pre and post-accident (source author)

This raises an interesting point: the owner of the building was acting in a similar fashion to the airline pilot and other commanders, in that his workers, like airline passengers and others, put their trust in those making decisions that could affect their safety and ultimately their lives. For the most part, transport passengers simply move along mulling over day-to day events without thinking that the pilot, driver of their train or captain of a ship, or indeed the transportation system itself, could result in some form of failure. In these circumstances they are largely in the SB mode, much like the workers in the collapsed factory.

Gorovitz and MacIntyre (1976) explored the notion of fallibility and identified three possible reasons why people can be fallible and errors arise. The first is ignorance, the second is that the knowledge is available but it is not used, and the third, is an "insurmountable kind", that the two philosophers termed "necessary fallibility". Concerning this last notion, Gorovitz and MacIntyre (1976) argue that there are some kinds of knowledge that science and technology cannot deliver. I have seen all three types of fallibility during my professional practice, and certainly the third, when people rely totally upon what the technology is telling them and simply do not think for themselves. (Three Mile Island is a case in point.) In the case of the building collapse, the owner, in my view, was a subject of the Dunning-Kruger Effect (1999); he was clearly unskilled in building safety and assumed he knew better than the regulators. As a consequence he ignored what he was told about the state of his building, and indeed ignored building regulations completely in the first place, and thought he knew best.

Leemann (2014) argues that rule breaking is driven by, among other things, personal attitude, operating environment and external pressure. I suspect that all three of these reasons prevailed, in this case, resulting in the deaths of the factory workers. The personal attitude of the factory owner to the 'disposability' of his workers, the poor and non-regulation state of the building, and the pressure no doubt placed on the owner to deliver factory goods, all contributed to the tragedy. According to a research team led by Van Kleef *et al*. (2011), people with power have a different view of the world and tend to live less by rules that are externally imposed. Such people ride rough-shod over others, bully to get their way, and do not respect basic rules of social behaviour. In my experience, such people also use their power to hide their lack of ability (Dunning-Kruger Effect).

In connection with this tragic event, my principle P3 is relevant (consultation), and since a commander (in this case factory owner) cannot know everything, it is essential to take advice from, and consult with, others. Each member of a team has a piece of the situational jigsaw

puzzle, including the commander. Bringing those pieces together to form a common understanding is essential in making sound decisions. However, if a commander has no desire to listen to advice other than his/her own, consultation is extremely difficult or impossible to achieve (Case Study #1, Chapter 4). Figure 28 (based on my principle P3, is a simple diagrammatic representation of the situation in the two circumstances where there is no consultation and where consultation forms a bridge in understanding situational awareness.

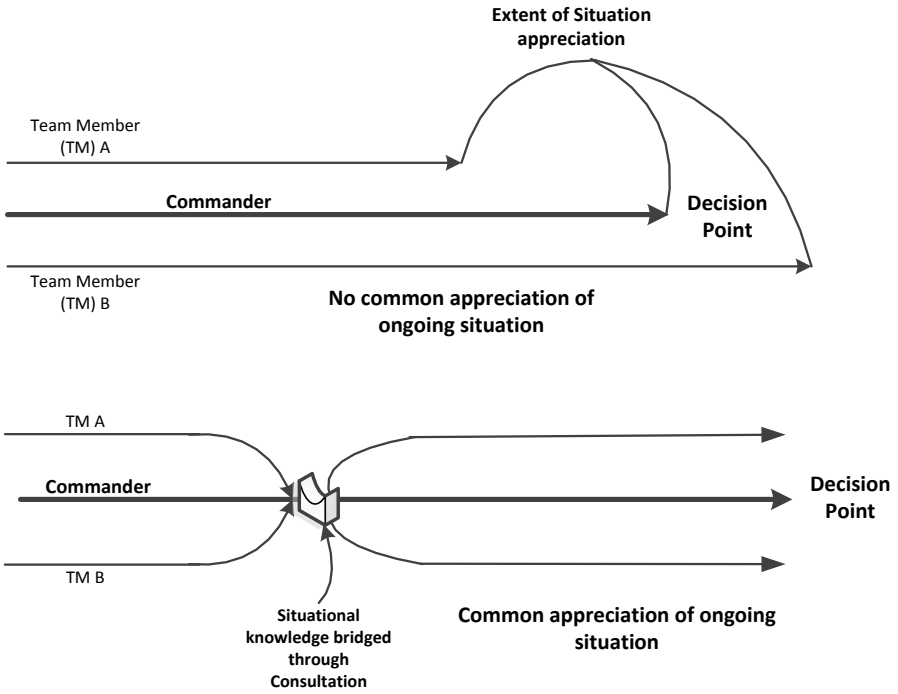


Figure 29 - Situational Appreciation - With and Without Consultation (source author)

6.8.5 Medical

By far the most commonly reported source of errors are in the medical sector, both clinical and surgical. According to Oyebode (2013) in 1996/1997, claims for medical negligence were estimated to have cost the National Health Service (NHS) in England GBP 235 million, and in 2010/2011 this figure had risen to GBP 863 million (Fenn *et a*l. 2000), indicating an over 250% increase in claims in 16 years[15]. Oyebode (2000) points out that the main cause of failure was a

[15] The increase may also have been down to the prevalence of the 'compensation culture' brought about by tenacious insurance companies.

disregard for policies and guidelines, even though personnel were aware of their existence. Oyebode (2000) cited Bognár *et al*. (2008) listing the detailed causes of rule failure (provided by the staff who presumably were involved in the failures) which included, *inter alia*, staffing levels, production pressure and hectic schedules. Oyebode (2013) does not provide any correlation between the reasons given by the staff and the failures themselves. Those that responded to the Bognár *et al.* (2008) research felt unable to either express their concerns or disagreement with their management. This situation is not uncommon and throughout my maritime career and since, I have come across these issues, particularly staffing issues and pressure of work, when errors are made. Not being able to discuss concerns with management is also common, and tends to reflect the character of managers and their inability to empathise with their staff. This issue can be addressed by the improved selection of managers and key stakeholder engagement (management and staff); I address this matter in Chapter 7 with the inclusion of regular stakeholder engagement within the command structure.

That said, a former colleague of mine who now works as a senior manager in an NHS Trust told me that a Care Quality Commission (CQC) inspection gave his Trust a warning about **medicines cabinets being left unlocked** on wards where there were vulnerable patients. The senior nurse responsible said that staff could not be bothered removing the keys because they were in frequent use – even though the clear policy was that they should be kept locked at all times. I have often heard the quote, attributed to the World War II flying ace Douglas Bader (Brickhill, 1954) that "*Rules are for the obedience of fools and the guidance of wise men",* and have occasionally come across rules that I have ignored when I have not perceived a risk in doing so (don't walk on the grass, for example). However, I do not think that leaving the keys in medicine cabinets potentially giving access to vulnerable patients is an acceptable risk. This I believe is the crux of rule breaking; those that do so may not fully understand the risks involved or, if they do, they choose to consider the risk as very low, or at least at a level with which they are willing to live. Harrison (2003) discusses the care of the patient with regard to risk and not the environment in which both patients and nurses operate. Nevertheless, had the nurses in the anecdotal case I have cited carried out frequent dynamic risk assessments on their patients, they may have conduced that it would be unwise to leave the medicines cabinet unlocked.

A recently published report by the CQC into the quality of patient care in the Southern Health NHS Foundation Trust (2016) recommended many improvements. The CQC inspection followed publication of the Mazars Report (2015) into the deaths of patients with learning difficulties and

mental health problems in contact with the Southern NHS Foundation Trust over the four years 2011 to 2015. The Report identified risks involving the safety of patients that were not being addressed. Risk is a feature of almost all activities in health and certainly in all types of emergency. I have identified a principle (P23) that considers the need to carry out regular dynamic risk assessments during the conduct of an emergency which is highlighted, in one form or another, by many, if not all, human error situations. Following on from the Mazars Report (2015), the CQC also made several recommendations concerning risk, including those posed by adequate staffing levels with appropriate competencies. The MOD call this requirement Suitably Qualified and Experienced Personnel (SQEP), and I come across it frequently when carrying out MOD P3M reviews.

There is little, in my experience that can realistically be done about matching staffing levels with work load, experience and skill requirements; to staff an organisation with the right people to deal with peak workloads or major emergencies is difficult without encountering substantial redundancy of personnel during times of normal activity. However, it is possible to manage workloads with schedule changes and contingency arrangements for major emergencies (which is done in hospitals), but these can take time to put in place. Regular review of the organisation can help with the process of matching staff levels with pressure points, and I address this in my organisational principles (Chapter 7).

However, it is difficult to understand why professional medical personnel would potentially cut corners or disregard the rules on so many occasions. The UK NHS has a Serious Incident Framework (NHS, 2013) that purports to address how to learn lessons from incidents. However, the NHS does not have a national investigating body, unlike the maritime, aviation, industrial, and transport bodies. In 2015, a UK Parliamentary Select Committee recommended the establishment of such a body:

> *"We therefore conclude there is a need for a new, permanent, simplified, functioning, trusted system for swift and effective local clinical incident investigation conducted by trained staff, so that facts and evidence are established early, without the need to find blame, and regardless of whether a complaint has been raised. This would greatly reduce or remove the need for costly major inquiries into clinical failure."*

In his discussion on the prevalence of reasoning error, Scott (2009) makes the point that *"Clinicians are sometimes less willing to adopt new beneficial interventions than to abandon old*

ineffective ones". Although Scott (1975) is uncertain as to the reasons behind such practice, he indicates that whilst a third of *adverse events* (as he calls them) in hospital patients involve errors such as slips, lapses or oversights in diagnosis management, almost half involved reasoning or the quality of a clinical decision, i.e. failing to decide or act upon clinical information. This resonates with my command principles (P1-P5).

In 2006 a study was conducted on multitasking in hospital emergency departments (EDs) (Laxmisan *et al*. 2007), which considered **information loss through interruptions**. The study revealed that on average interruptions occurred every 9 and 14 minutes for attending physicians and residents respectively. The authors contend that the communications process in EDs is complex and taxing and can compromise patient safety. Clearly, in these circumstances the clinicians involved need to be able to understand and filter all the information coming their way and to identify if any interruption is contributing to the case they are handling and, if not, to ignore it. I have found from my own experience in the maritime field that this is easier said than done, as it is impossible to know if an interruption is contributing or not until time is taken to listen to what is being said. I have heard commanders say, 'give me all the information you have and I will decide if it's relevant or not'. I do not subscribe to this view. The Laxmisan study (2007) concludes that interruptions are a necessary part of life in EDs that requires repeated prioritization of tasks, but as long as continuity of information flow is assured toward the task in hand, medical errors may be avoided. Technological solutions may also help in this regard, but see my discussion on autopsies below. The same can be said of any emergency environment and it is important for the person in charge to listen to information coming in, but to 'keep on track'.

It is vital, therefore, for the emergency environment and all those within it to maintain communication discipline. My principle concerning 'time-outs' (P27) is important in this context as it not only ensures that everyone is up to date with ongoing developments, but it enables the commander to consolidate his/her understanding of the current situation.

It is commonly known that **autopsies** are often used to identify the cause of death, particularly when the death is unexpected. The process can uncover clinical, or even surgical, errors, and has benefitted medicine over the years it has been in place – or so I thought. Surprisingly, in the USA, for example, autopsies are used less and less. The surgeon Gawande (2002) discusses the outcomes of autopsies and explains that in their early days they prevented errors, insofar as doctors could find out whether or not their diagnoses were correct. Nowadays, according to

Gawande (2002), autopsies appear to be on the wane as the confidence of physicians in their diagnoses increases. In 1995 the United States National Center for Health Statistics stopped collecting autopsy statistics (Gawande, 2002). However, Gawande's research uncovered statistics from studies undertaken in 1998 and 1999 that about 40% of autopsies showed misdiagnosis. Until this revelation Gawande considered the percentage to be about 1 to 2 %. A comparison with the rates from statistics in 1938 (Lundberg, 1998) showed Gawande that the situation had not improved over time. In most cases, Gawande (2002) says, it wasn't technology that failed in diagnosing patients but that the doctors failed to make the right diagnosis in the first place. In other words, the technology may have been available but the doctor failed to use it. Gawande (2002, pp.193) refers to the doctors' discouragement of autopsies today as their "*twenty-first century, tall-in-the-saddle confidence*".

To reduce the number of ***"common, deadly and preventable problems in all countries and settings in surgery",*** the World Health Organisation (WHO) introduced a **Checklist and implementation Manual** in 2008. Bonifield (2012), CNN's senior medical correspondent, cites ten cases of medical (including surgical) errors, including treating the wrong patient, leaving surgical instruments inside the patient, and using the wrong equipment. The Who approach covers the patient's arrival at the operating theatre (Sign in – *inter alia*, ensuring the right patient is being operated on), preparation for surgery (Time out), and completion of surgery (Sign out - covering such things as checking that all surgical instruments are accounted for). In essence, by following the WHO Checklist, surgeons and their support staff ensure a clear and concise procedure and do not simply make assumptions on the basis of patient records or on the assumption that they (the surgeons) are thoroughly familiar with the surgical procedure.

The aviation industry also uses pre-flight checklists that are rigorously applied and this approach is echoed across many industries. For example, fire services have a range of checklists covering fire appliance maintenance, and procedures for entering a fire scene (Glosfire, 2015), and there are many other examples in the nuclear, oil and gas industries. I have also suggested the use of checklists for MMEs (P3 and P30).

6.8.6 Summary

In this section I have introduced some real-life examples of errors and reviewed a variety of psychological links and thinking behaviours from relevant literature and accident reports. Clearly my examples are not exhaustive and I could identify very many more. As with my

appraisal of cognitive decision making, additional principles have arisen, which are identified in the next section of this Chapter.

In addition to those of my principles I have touched upon already, several points emerge from this brief appraisal that endorse and support other principles in this study. Among these are: Selection and experience (P10-P12); Teamwork and consultation, crew resource management, communication (P3, P7-P9, P15) appropriate and relevant training (P13-P14), and following emergency response sequence (checklists, P31). Moreover, the actions of the pilots of Flight 1549 appear to endorse all of my command decision principles (P1 to P6). In the following section I draw together additional principles I have derived from the material reviewed in this Chapter.

6.9 Additional Principles of Command Derived from the Literature Appraisals

The previous sections of this Chapter have provided evidence that the principles of command I have evolved during my career are largely supported by cognitive decision making studies and real-life examples. I also sought to identify studies that qualified or undermined my principles; these are considered at the end of this section. My conclusion from this appraisal is that throughout my career I have largely adopted favourable cognitive decision making attitudes and approaches of which I was unaware. It appears as though my professional practice has run a somewhat parallel course with academic studies, the latter more aware of professional practice in general but the former not generally aware of the latter, as in my case. In this section I will seek to uncover further principles from the cognitive decision making studies I have appraised that could improve the implementation of the C4 framework within the context of MME, and provide additions to my taxonomy of suggestions to improve C4 framework success as derived from my case studies and professional practice.

In my first principle (P1) I discuss decision making under time constraints and with limited information availability, but I did not consider developing any principles concerning the information itself. Payne (1976), Hogarth (1987), Yates, (1990), Maule and Edland (1997), Orconez and Benson (1997) and Nordstrom *et al.* (1998) consider to varying degrees decisions made under pressure in terms of the complexity of the information involved. They conclude that decision makers tend to perceive time pressure, along with a high volume of information (information overload), as making the decision more complex that it actually is. In essence, decision makers can consider themselves to be under more pressure than they actually are and

produce poor decisions as a result. In my simple terms it is like trying to multi-task or open too many files at once and not being able to prioritise what is and is not important; sometimes the desk has to be cleared of chaff to make the situation clearer. However, the situation aboard American Airlines 756 was certainly complex and it was certainly essential for the pilot and co-pilot to prioritise the information they received – so much so that communication between the two was observational as well as audio; filtering information was vital. The success of the emergency was also down to exception teamwork. The two pilots worked so closely together it was almost as though they were reading each other's thoughts. Developing teamwork of this calibre can clearly pay dividends and is a principle I endorse and include in my list.

To improve the situation, particularly at the outset of an emergency when pressure is greatest upon the decision maker, I would ensure that information is filtered and not allowed to amass; the vital facts only should be considered. For example, being told that the cargo of a stricken ship has come from one port and destined for another, or the ship is 250 metres length overall are not facts that would influence initial decisions but they, along with a great many pieces of information are fed to the commander in the mistaken belief that he or she needs everything. Commanders and operations teams need to be schooled in information selection as well as analysis under pressure. This could be treated as a necessary people skill on the one hand and a command decision application.

The Lancaster rail near miss event highlights the need for those in decision making position to remain vigilant. The RAIB makes a recommendation about working patterns, and although the lookout was only doing 2-hour shifts he was engaged in activities that were for the most part repetitive. This resulted in an AM slip near the end of his shift suggesting that had the shift been shorter the lookout would have maintained his vigilance. I would agree that this may have helped but it seems that it was the high number and habitual nature of his tasks that caused the slip. For example, if he had carried out the same number of tasks within the first hour, would this has caused a slip earlier in his shift? Nevertheless, the point is well made that length of shift and work load are aspects that should be considered by those responsible for the success of emergency operations. In the UK the Health and Safety Executive (HSE) provides guidance on such matters (HSE, 2015).

I get from this three additional principles and one amended principle:

People - Command
Compartmentalize significant information and avoid amassing substantial detail of no direct relevance
People - Skills
Be able to assess and filter initial information from an emergency to extract only that information pertinent to critical decision making
Frequently exercise teamwork in emergency situation simulations
Organisation - Design
P38 as amended: Regular review of organisation, including work patterns to avoid fatigue.
Ensure that any recommendations made to improve the organisation are followed up through a monitored action plan at pre-determined periods.

Related to these three principles, Russo and Shoemaker (1992; 2001) discuss the effects of managers being bombarded with information when faced with decisions. They make the point that a manager tends to know which information and from which individual is more credible yet can be swayed by persuasive argument. Although the article is intended for a business audience it can nevertheless apply to emergency management; I have found that many people in the command centre environment will offer an opinion, if only to raise their profile and just for the sake of it. These opinions often turn into 'stormy night' stories of, "*I remember when…"* and are unhelpful and commanders should filter them out as unnecessary information.

it is therefore important to filter out non-essential or erroneous information at the outset of an emergency and throughout the emergency (training of operations room communication personnel is essential in this context). It is also important, as Cushing and Ahlawat (1996) discuss in a business context, to bear in mind that information received at the outset of a situation may either be forgotten or diluted after time has elapsed even though it may continue to be important to future decisions. This tendency is referred to as the *Recency Effect,* so it is important to ensure that essential ongoing information is recorded and remains established in the decision maker's mind. It is claimed that President Bill Clinton suffered from this effect (Lauter, 1993) in that he appeared to make his decisions at the last minute and apparently on

the last advice he was given. Lauter (1993) referred to an occasion when Clinton was to decide whether to seek a fifth term as Arkansas Chief Executive; he had sought the advice of numerous people but according to Lauter did not actually make his mind up until part way through his speech to announce or otherwise his candidacy. Kennedy and Ashton (2002) identify a means of eliminating the recency effect through a simple self-review technique. They suggest that the recency bias can be avoided by regularly and frequently reviewing information that has been introduced since a decision was first made. The contention is that self-reviews tend to treat all information as recent. This leads me to another suggested principle of command that resonates with my professional practice:

People - Command
Carry out a regular and frequent self-review of important information from the outset of the emergency to avoid focusing too heavily on most recent information

6.10 Contrary Evidence

Previously I have focused on those cognitive decision studies that align with my principles. There are however some studies that do not conform to my way of thinking. For example, my views on pre-determined plans are not widely accepted. Reibstein (2006) extols the virtues of what he calls 'Preventative Preparedness', and contends that emergency planning can provide a much needed impetus for improving the way things are done. He suggests that a way to achieve this is to integrate all emergency plans including pollution prevention. I do not disagree that in preparing 'plans' there can be a focus on how the emergency response can be improved, presumably from past experiences. However, from the biases I have considered in support of my contention that pre-determined plans can mitigate against a successful response, I do not consider that adopting a planning process for the purpose of reviewing arrangements is a good approach – unless it is used for training.

There are other mechanisms for improving an emergency response – indeed many of the principles I have discussed in this study fall into that category. My first principle involving delaying a decision if time is available would not be universally accepted. Drucker (1986) contends that in times of crisis there can be opportunities (the "no risk only opportunities" doctrine). Drucker's view with regards to business practices is that doing nothing, or not

enough, in times of crisis can be enough to sink a company. His view of my principle may be that early decisions should be taken to avoid losing opportunities and that any consequences of an early decision can be adjusted to suit the changing circumstances. This of course is true but making an early (and perhaps hasty) decision at the outset of an MME could result in the wrong resources being committed to the wrong location; resources for an MME are not readily duplicated. This issue also raises the dimension of time in the decision making process. I have mentioned earlier in this study that whilst minutes can be valuable when dealing with an MME, waiting a few more to ensure that the decision taken is the best that can be is worth the risk and can provide improved opportunities for success.

Considering the remaining four of my original personal principles of command, I cannot find any dissenting study supporting indecision (dithering), neither can I find any support for chasing a lost cause (sunk effect, Koehler and Harvey (2004) or for endorsing an consultation doctrine (Figures 23), nor any studies that would support a view that varied and appropriate experience does not provide valuable support for heuristic intuitive decision making. Ericsson *et al.* (1993) emphasised that practice had to be appropriately varied for it to be effective and it is this principle that I support; it is no use repeating the same experiences in practice over and over again in the hope that the situation may arise in an emergency; I have witnessed this when emergency response organisations carry out the same or very similar exercise every time they practice an emergency. They become very good at one or possibly two scenarios but fail when something unexpected happens.

6.11 Principles and C4 Framework Links

The thrust of this study rests on my contention that the C4 framework as described in my exemplar activity map (Chapter 3, Figure 6) is largely fit for purpose but it is its implementation that can fall short during an MME. My original six principles together with those educed from my appraisal of some cognitive decision-making research are presented as measures to improve the C4 framework implementation. These principles together with those derived from my case studies and survey for a comprehensive set of principles that cover all aspects of the C4 framework, including improvements in structure and implementation.

The comprehensive list is presented in Chapter 7 and is intended to be applied to the framework and to those who could be responsible for implementing it from novice to experienced professional.

6.12 Conclusion

In this Chapter I have considered a small number of cognitive decision making studies and matched them with my original personal command principles. From this literature, I have also suggested three additional principles, two related to command and one as a skill for commanders and others. Cleary, given the vast amount of literature on cognitive behaviour and decision making it has not been possible to cover all aspects of cognitive bias in command in this study. Nevertheless, I believe that this brief review of cognitive decision making studies has enabled me to identify some additional suggested principles and the potential for further research in matching the principles of practitioners with current cognitive decision making studies. It has also confirmed to a good degree my view that the practical principles I have adopted throughout my career have a reasonably sound basis in academic studies. Table 14 sets out a summary of the principles discussed or consulted in this Chapter together with the cognitive biases and thinking approaches against which they have been considered or matched.

Table 14 - Principles and Cognitive Bias/Thinking Approach

	Principle	**Cognitive Bias/Thinking Approach**
P1	Information availability and time –Don't make decisions or act upon them until you have to – hasty decisions can result in disastrous consequences. If you have time use it! Often there isn't time and decisions in an emergency need to be made quickly	Time Delay Traps; short-termism; anchoring heuristic; insufficient adjustment; underadjustment; jumping to conclusions; intuitive errors; what you see is all there is (WSIATI); thinking fast and slow; availability; representativeness; delay; masterly inactivity; choice; uncertainty; doing nothing; Student syndrome; AM slips; SB, RB, KB transitions;
$P1_a$	It must be clearly understood why making or acting upon a decision is delayed	Time Delay Traps; short-termism; anchoring heuristic; insufficient adjustment; underadjustment; jumping to conclusions; intuitive errors; what you see is all there is (WSIATI); thinking fast and slow; availability; representativeness; delay;
P2	Indecision – Don't dither and procrastinate when making a decision – opportunities for action may be lost	Indecision; Reluctance to choose; dithering effect; Student syndrome;

P3	Consult team members if there is time about options for action and accept that as a commander you don't, and cannot, know everything; empathise and listen to the opinions of others. But remember that a decision has to be made and it is you who has to make it	Anchoring as accessibility; anchoring as adjustment; Perceptions; Right people in the right places; Personal bias; Groupthink; Base rate; Confirmation evidence; Conservatism; Frequency/redundancy; Illusion of control; Self-fulfilling prophecies; Attentional;
P4	Learn to fail – be courageous in accepting that a decision that you have taken is wrong and be prepared to take a different path	Learn to fail; Obstinacy; Perseverance; Sunk cost; Concorde fallacy; Escalation; Commitment; Escalating commitment; Desire; egocentric; Loss aversion; Illusion of control; Prior hypothesis bias; Overconfidence; Status quo;
P5	Pre-determined plans can be useful tools at the outset of an emergency but avoid any plan that attempts to take you through a scenario	All hazard planning; Mission creep; Recall; Series position effect; Rosy retrospection; Framing; Planning fallacy; Similarity; Testimony; Familiarity; Habit;
P6	Take every opportunity to gain operational experience however small – it will build your intuition and improve your heuristic responses.	Intuition; Predictive judgements; Learned heuristics; Gambler's fallacy; Infallibility;
$P6_a$	Persevere – If a consultation process has been undertaken and, following the appraisal of all available advice, and a decision has been made, see it through, unless a further comprehensive consultation and appraisal strongly suggests otherwise.	Perceived time pressure; Perseverance; Overconfidence; Infallibility; Self-confidence.
$P6_b$	Compartmentalize significant information and avoid amassing substantial detail of no direct relevance	Information filtering; Recency effect; Series position effect; Von Restorff effect; SB, RB, KB levels;
$P6_c$	Carry out a regular and frequent self-review of important information from the outset of the emergency to avoid focusing too heavily on most recent information	Recency effect; Self reviews; Order; Recall; Reference point; Series position effect; AM slips;
$P7_a$	Be able to assess and filter initial information from an emergency to extract only that information pertinent to critical decision making	Information filtering; Scale;

Part IV

Conclusions

Chapter 7

My Contribution to the Implementation of the C4 Framework for the Management of MME

7.1 Literature - Cognitive Decision-Making and Non-maritime Real-life Events

In my historical summary of the development of the C4 framework I suggested that the treatment of C4 has been primarily academic, and tended to focus on structure and process within the framework rather than on flaws in the human interface from a practitioner's viewpoint. Although there are examples of individual C2 experience from a military perspective in biographies and autobiographies I have not uncovered a treatment that originates from a base of professional experience and takes the reader from definitions through activity descriptions to principles for command and other components of the C4 framework, nor have I identified any that consider the people, process, resource, organisation, political and cultural context. In my judgement what is lacking from extant literature is practical advice about what should be addressed rather than discussions about how the C4 framework should work in an academic sense. I am not suggesting for one moment that the literature is inadequate in this regard but simply that the approaches I have reviewed do not actually help practitioners (such as myself) do better when implementing the C4 framework and handling MMEs. Moreover, many of those that work in the emergency management field are more practically rather than academically minded and would struggle, like me, with some of the more complex academic texts. Similarly, in conducting a matching exercise with my principles of command and cognitive decision making studies I found the texts to be academically based and somewhat out of my comfort zone. Nevertheless, the exercise proved helpful by confirming my derived principles and suggest several others that might be useful in the successful implementation of the C4 framework.

To supplement the appraisal of cognitive decision-making biases, focused primarily on maritime emergencies, I have considered a range of real-life non-maritime incidents. The incidents involved aviation, medical, nuclear, rail and industrial fields and produced an amendment to my initial list (Table 15, P38) and two further principles (Table 15, P16, P45).

I feel, therefore, that I have contributed to the literature by introducing a practical set of principles to what can be a complex and demanding arena. The principles I have put forward can be used in a dynamic situation or as a means of preparing people and organisations for an MME. I also believe that the principles can be adopted for minor and less demanding emergencies and not necessary just in a maritime context.

7.2 Principles to Improve the Implementation of the C4 Framework

In Chapter 1 I have set out my personal context for the study and introduced a root definition for the C4 framework as I consider it applies to the management of MME. In Chapter 3 an activity map is drawn that sets out the relationships between each of the C4 framework components together with overarching categories that establish the environment in which the components reside. These are identified as people, processes, resources, organisation, political and cultural influences. The activity map can be built upon or modified by others to interpret their own understanding of the C4 framework and to seek further improvements. As it stands without amendment, as a picture of actions, it is, in my view, a useful addition to a practitioner's armoury of C4 understanding.

In Chapter 4, I discussed seven case studies that I have used to draw out key statements and observations of C4 implementation and their overarching categories. I would recommend this approach to other researchers as a way of gaining lessons from real emergencies and related activities and policies to seek future improvements. In this context, I believe I have introduced to some extent a methodology that can be adapted for improved lessons learned approach in the aftermath of MMEs or lesser emergencies; I do not take credit for the origin of the methodology as this is derived from that used by Wigmore (1913). The basic approach is that used by lawyers defending or prosecuting defendants – a for and against approach that I have called Favourable (F) and Unfavourable (U) statements and observations as discussed and defined earlier in this study.

From the body of evidence discussed in Chapter 4, (Case Studies) I determined a list of principles that, if adopted, could do much to improve the implementation of the C4 framework, notwithstanding the health warning I have placed upon them. That said, I consider the approach I have adopted to be one that would be helpful to those seeking further improvements in C4 framework implementation, and the management of MMEs. A consolidated list of 46 principles for improving the implementation of the C4 framework is shown in Table 15 (the first 7 highlighted are those developed from my experience and professional practice throughout my career.

Table 15 - Consolidated List of Principles to Improve the Implementation of the C4 Framework for the Management of an MME

Label	People –Command
P1	Don't make decisions until you have to – hasty decisions can result in disastrous consequences. If you have time use it! Often there isn't time and decisions in an emergency need to be made quickly
$P1_a$	It must be clearly understood why making or acting upon a decision is delayed
P2	Don't dither and procrastinate when making a decision – opportunities for action may be lost
P3	Consult team members and attempt to reach consensus if there is time about options for action and accept that as a commander you don't, and cannot, know everything; empathise and listen to the opinions of others. But remember that a decision has to be made and it is you who has to make it
P4	Learn to fail – be courageous in accepting that a decision that you have taken is wrong and be prepared to take a different path
P5	Pre-determined plans can be useful tools at the outset of an emergency but avoid any plan that attempts to take you through a scenario
P6	Take every opportunity to gain operational experience however small – it will build your intuition and improve your heuristic responses.
P7	Persevere - If a consultation process has been undertaken and, following the appraisal of all available advice, and a decision has been made, see it through, unless a further comprehensive consultation and appraisal strongly suggests otherwise.
P8	Compartmentalize significant information and avoid amassing substantial detail of no direct relevance
P9	Carry out a regular and frequent self-review of important information from the outset of the emergency to avoid focusing too heavily on most recent information
	People – Commander Qualities
P10	Potential recruits for emergency response organisations and the least those identified for command positions should be evaluated for their ability to make decisions.
P11	Candidates for command positions should have a minimum of 3 years' experience within a professional emergency response organisation.
P12	Commanders must be evaluated for and exhibit: Flexibility in their approach to decision-making, and demonstrate authority in command
	People -Skills
P13	Be able to assess and filter initial information from an emergency to extract only that information pertinent to critical decision making
P14	Be able to assimilate and understand complex MME information, including the need for a COP, and determine options for action; prioritise decisions – know what is important to the success of the operation and what is not.
P15	Keep operational communications simple and use common words and phrases – avoid jargon and use competent translators as necessary

P16	Frequently exercise teamwork in emergency situation simulations
	People - Knowledge
P17	Fully understand the organisation in which the C4 framework resides and its external influences
P18	Understand all potential issues (legal, jurisdictional, procedural, political) that may affect the outcome of an MME
P19	Understand basic maritime nomenclature
P20	Understand the strategic, tactical and operational detail of all potential resources that can be involved in an MME
P21	Understand shipboard processes and procedures during an emergency on board and be able to identify sources of expert shipboard information and advice
P22	Within your command understand the geographical areas in which MMEs can occur and the location of potential safe havens for stricken vessels
	Process - Design
P23	Establish clear liaison links and procedures with external organisations both national and international – do not wait until an MME occurs
P24	Introduce Dynamic Risk Assessment procedures at key operational stages of the emergency to evaluate options for action – make it standard practice even if the same assessment is repeated several times.
P25	Establish clear SAR procedures for the preservation of life
P26	Appropriate level of command resident in operations centre and not remote – the right people in the right places at the right time
P27	Establish 'time-out' discussion periods with operational personnel at suitable points in the development of an MME and relieve operators in vigilant posts to avoid fatigue
P28	Ensure communication links in the operational process connect to all potential resources for an emergency
P29	Ensure that all communications links are fit for purpose and are regularly tested and maintained
P30	Prepare all necessary paperwork as templates (legal, media etc.) in advance to avoid unnecessary delays
P31	Include checklists to enhance operational decision making and to improve information flow
P32	Introduce regular updates from all resources involved with the MME at key stages and align with Dynamic Risk Assessments
P33	Ensure all senior official/political and international dimensions involved in the emergency and those that need to are kept informed
P34	Ensure that contemporaneous records are kept and consideration given to records that may be required for any future legal actions
P35	Introduce situational modelling into the operational process
	Resources - Design

P36	Ensure that as many of the potential resources that may be used in an MME are owned by the commanding authority and if not operating agreements should establish clear command and control arrangements
	Organisation - Design
P37	Clear lines of command
P38	Regular review of organisation, including work patterns to avoid fatigue
P39	Ensure right level of command for MME
P40	Examine the organisational culture regularly
P41	A single joint RCC for all emergency resource (land, sea and air) should be established as an organisational ideal
P42	Organisational structure should monitor the development of and take advantage of new technology
P43	Ensure that any recommendations made to improve the organisation are followed up through a monitored action plan at pre-determined periods.
	Political & Cultural Influences -Design
P44	Brief senior officials and government ministers on C4 framework and agree engagement MME protocols
P45	Conduct regular MME stakeholder seminars to ensure consistency of approach and cultural understanding of the C4 framework and involvement in MME

However, given such a comprehensive list, I doubt that practitioners in the field will easily adopt them. I have, therefore, undertaken a process of refinement to rationalise the principles into a more manageable structure. This is discussed in the following section.

7.3 Refinement of the 46 Principles

To refine my initial list of 46 principles I considered several headings under which I could marshal them. For example, I considered headings such as Prime, Sub-prime, and Beneficial as potential categories under which the principles could reside to indicate those principles that are directly relevant to the decision making in an emergency (prime), those that would support it (sub-prime), and those that the C4 framework would benefit from (beneficial). These headings are in common use in military and civil project, programme, and portfolio management (P3M) and describe the relationship between contractors and the contracting authority; the prime contractor being responsible for the direct delivery of the contract, sub-contractor in support, and beneficial is the term used to indicate measures that would benefit the project (developed from reviewing contract performance). However, I recognised when reviewing the principles

that categories such as these did not convey the relationship between those dynamic principles operating when an emergency happens, the steady state of being ready for an emergency to occur, and the structure in which these two states reside. Moreover, the prime, sub-prime, and beneficial categories, are used in an administrative environment, and would not convey to emergency practitioners the delineation between escalating operating levels. I chose, therefore, to adopt a more understandable and operationally appropriate nomenclature, taken from military and civil emergency usage:

- Capability – those principles that give the organisation the capacity to conduct an emergency response;
- Readiness – those principles that ensure the 'capable' organisation is 'primed' to 'respond';
- Response – those principles that are applied during the dynamic phase of an emergency when an operation to resolve the situation is in progress.

In common usage, for example, *Capability* can refer to the provision of helicopters for SAR at a particular strategically advantageous location. *Readiness* it the status of the helicopters to carry out the SAR task (fully maintained and ready), and *Response* is the act of carrying out the task itself (SAR). It is common in emergency plans for four phases of an emergency to be defined as: Mitigation (preventing an emergency occurrence); Preparedness (preparing to handle an emergency); Response (responding to an emergency), and Recovery (recovering from an emergency). However, the scope of my study does not specifically include mitigation or recovery, and I prefer to consider the provision of a Capability as the result of efforts directed toward mitigating the effects of an emergency (e.g. limiting loss of life), including the lessons from the recovery phase (e.g. improved procedures). I concluded that using terms that are readily understandable by emergency service practitioners from existing nomenclature would provide a sensible classification for my principles.

Having decided upon classification, for my initial refinement I needed to consider under which category each principle resides, bearing in mind that there may be some overlap. My first pass at placing each principle under each of the three classifications involved a simple listing of principles under each heading without modifying them in any way. This provided me with a basis to break down each of the three lists into sub-categories. My logic was to consider each classification in turn, starting with Response. I sought out those principles that would specifically be applied to activities when the emergency was underway. A good starting point for this

exercise were the processes I had set out in Figures 22 and 23 (Chapter 6). Re-examination of these processes naturally revealed four sub-categories: Decisions; Consultation; Information, and Evaluation. I next considered the Readiness classification and considered the principles that would be needed to ensure that the C4 framework was ready to respond. For this exercise I turned to my exemplar Activity Map (Chapter 3, Figure 6), which prompted me to seek out the principles that would be needed for the response phase to function. This led to two sub-categories: Knowledge, and Status. It occurred to me when refining this phases that some of the principles I had placed in it may fit better in the Capability classification, and noted these principles for my consideration of the Capability classification itself. To place principles under the Capability classification I again referred to my exemplar Activity Map, seeking out the background organisational issues that, together, made the C4 framework fit for purpose. The sub-categories that fell out of this exercise were: Structure, Process, Command selection, and stakeholder management; the first three are sub-categories that can be found in the exemplar Activity Map (Chapter 3, Figure 6) but the last one is a term I often use in my consultancy work and is well understood by those in emergency management circles. In essence, it means engagement with all those who can have an impact or influence the C4 framework and the management of an MME.

My next step was to review each of the principles within each sub-category, remove any duplication and combine principles where they covered similar themes. For example, I brought together into a single principle (new principle Response, Command Decisions 1.) my original principles P1 to P3 to give a logical flow to the principles: Don't dither – don't make a decision until you have to – and if you delay know why. Similarly, I have marshalled all those principles involving information flow and communications.

During this process it became clear that some of the revised 'consolidated' principles could be better placed under a different classification or sub-category. For example, I moved new principle 20 (now under stakeholder management) from the Information sub-category as it is an activity that is not carried out during an emergency but is part of the C4 framework education process that enhances the ability of the organisation to function in an emergency. The first refinement exercise produced the classifications and sub-categories summarised in Table 16.

Table 16 - Refinement of 46 Principles into Response, Readiness and Capability

Response	Original Principles
Command Decisions 1. Don't dither and procrastinate when making a decision and don't make decisions until you have to, but if you delay – know why. 2. Once a decision is made, persevere and see it through, unless a further appraisal strongly suggests otherwise. 3. Learn to fail – be courageous in accepting that a decision that you have taken may be wrong.	P1/P1a/P2/P4/
Consultation 4. Establish 'time-out' discussion periods with operational personnel at suitable points in the development of an emergency, reviewing the common operating picture (COP), empathising and listening to the opinions of others, and attempt to reach consensus. 5. To assist in determining options for action, introduce regular updates from all resources involved with the MME at key stages and know what information is important to the success of the operation and what is not.	P3/P7/P14
Information 6. Carry out a frequent *self-review* of all relevant and significant information to avoid focusing too heavily on most recently received information, assess and filter the information and compartmentalize 'decision' material to avoid amassing substantial detail of no *direct* relevance. 7. Include checklists to enhance routine operational decision making. Ensure that contemporaneous records are kept, in particular records that may be required for any future legal action and commander training 8. Keep operational communications simple and use common words and phrases – avoid jargon. Ensure communication links in the operational process connect to all potential resources for an emergency, including all senior official/political and international bodies.	P8/P13/P32/P9/P15/P33/P27/P30/P34/P14/P34
Evaluation 9. Introduce situational modelling into the operational evaluation process and include Dynamic Risk Assessment procedures at key operational stages to evaluate options for action – make it standard practice even if the same assessment is repeated several times.	P24/P32/P35

Readiness	Original Principles
Knowledge 10. Fully understand the organisations in which the C4 framework resides and its external influences and all potential issues (legal, jurisdictional, procedural, political, etc.) that may affect the outcome of an MME.	P17/P18/P19/P20/P21/P22/P6/P16

11. Understand basic maritime nomenclature, and the strategic, tactical and operational detail of all potential resources that can be involved in an MME, including expert advice, shipboard processes and procedures during an emergency on board. 12. Within your command, understand the geographical areas in which MMEs can occur and the up-to-date location of potential safe havens for stricken vessels 13. Take every opportunity to gain operational experience, however small; it will build your expertise and improve your heuristic responses. 14. Frequently exercise teamwork in emergency situation simulations	
Status 15. Ensure the appropriate level of command resides in the operations centre and not remotely –the right people in the right places at the right time, with clear lines of command. 16. Ensure that any recommendations made to improve the organisation are followed up through a monitored action plan at pre-determined periods.	P26/P37/P39/

Capability	**Original Principles**
Structure 17. Regularly review your organisation, including fatigue avoidance work patterns, and: • understand and improve the organisational culture; • take advantage of new technology; • consider a single joint Rescue Coordination Centre (RCC) for all emergency contexts (land, sea and air) as an organisational ideal; and, • consider the ownership and command and control arrangements of resources, and establish operating agreements with those not owned by the command authority.	P38/P40/P41/P43 /P36
Process 18. Establish clear search-and-rescue (SAR) procedures for the preservation of life. 19. Ensure all communications links are fit for purpose and are regularly tested and maintained, including clear liaison links and procedures with external organisations both national and international. 20. Prepare all necessary paperwork as templates (legal, media etc.) in advance to avoid unnecessary delays. 21. Avoid pre-determined scenario-driven plans. 22. Ensure that any recommendations made to improve the organisation are followed up through a monitored action plan at pre-determined periods.	P25/P30/P23/P5/ P29/P6/P43
Command Selection 23. Pre-evaluate potential recruits for emergency response organisations, and particularly those identified for command positions, for their ability to make decisions, be flexible in their approach, and demonstrate authority in command. 24. Candidates for command positions should have a minimum of 3 years' experience within a professional emergency response organisation.	P10/P11/P12
Stakeholder Management	P44/P45

25. Brief senior officials and government ministers on the C4 framework and agree engagement MME protocols 26. Conduct regular MME stakeholder seminars to ensure consistency of approach and cultural understanding of the C4 framework and involvement in MME	

The 46 principles have been reduced to 26, and fall under the 3 main headings and 10 sub-headings. The original principles identified from Table 15 are noted in the final column of each refined principle to enable the source principles to be identified.

Having reviewed Table 16 from a professional practitioner's viewpoint I concluded that further refinement was necessary to remove references to the principles and reduce the explanatory text to give the list a 'stand-alone' operational presentation. The result is Table 17.

The principles, as set out in Table 17, 18, and 19, can be applied during any type of emergency and provide the focus for training, including simulated exercises (Response & Readiness) and for developing the Capability from which Response and Readiness can be achieved. It would also be beneficial for MME authorities in particular to match the refined principles to the exemplar Activity Map (Chapter 3, Figure 6) to gain an improved insight into the implementation of the C4 framework, and the issues that can affect it. However, the three final tables (Tables, 17, 18 & 19) have been presented to enable them to be used in an emergency across all fields and are not confined to those involving an MME. Indeed, the principles that I have applied to decision making can be adopted for general use and not just in emergency situations, particularly the first three under the Response heading.

Table 17 - Capability Principles

Capability
Structure Regularly review your organisation, including: • Improvements to the organisational culture; • Advances in new technology; • Consideration of a single Command Centre for all types of emergency (land, sea and air); • consider the ownership and command and control arrangements of resources, and establish operating agreements with those not owned by the command authority; • ensure that recommendations from lessons learned and Inquiries are implemented.
Process Establish clear standing operating procedures (SOPs). Ensure all communications links are fit for purpose and are regularly tested and maintained, including liaison links and procedures with national and international external organisations. Prepare all necessary templates (legal, media etc.) to avoid unnecessary delays. Avoid pre-determined scenario-driven plans. Ensure that any recommendations made to the organisation are followed up through a monitored action plan. Fully understand the C4 framework that applies to your organisation.
Command Selection Assess potential recruits, particularly those identified for command positions, for their ability to make decisions, to be flexible in their approach, and to demonstrate authority in command. Candidates for command positions should have a minimum of 3 years' experience within a professional emergency response organisation.
Stakeholder Management

Senior officials, government ministers and all key stakeholders, should be briefed on the organisation's C4 framework and agree engagement protocols.

Table 18 - Readiness Principles

Readiness
Knowledge
Understand basic operational nomenclature, and the operational, tactical, and strategic roles and responsibilities of all resources that can be involved in an emergency. Understand the geographical areas in which emergencies can occur, and the up-to-date locations of potential safe areas to assist in resolving the emergency (e.g. safe havens for ships or safe zones for emergency service personnel). Take every operational to gain experience, however small to build your expertise and improve your operational intuition. Frequently exercise teamwork in emergency situation simulations
Status
Ensure the appropriate level of command resides in the command centre with clear lines of command and not remote from the central command team. Ensure that any recommendations from lessons learned or Inquiries, made to improve the organisation, are properly followed up through a monitored action plan.

Table 19 - Response Principles

Response
Command Decisions Don't dither and procrastinate when making a decision and don't make decisions until you have to, but if you delay – know why. Once a decision is made, persevere and see it through, unless a further appraisal strongly suggests otherwise, and, Learn to fail – be courageous in accepting that a decision that you have taken may be wrong.
Consultation Establish 'time-out' discussion periods at suitable points in the development of an emergency, relieving vigilant posts to avoid fatigue, understand the common operating picture (COP), and attempt to reach consensus on future options. Introduce regular updates from all resources involved with the emergency and filter out unimportant information.
Information As a commander, carry out a frequent *self-review* of all relevant and significant information. Include checklists to enhance routine operational decision making. Ensure that contemporaneous records are kept, in particular records that may be required for any future legal action and lessons learned for future training. Keep operational communications simple and use common words and phrases – avoid jargon, and use competent translators if necessary. Ensure communication links connect to all potential resources in an emergency, including all senior official/political and international bodies.
Evaluation Introduce 'what if' modelling into the operational evaluation process and include Dynamic Risk Assessment procedures to evaluate options for action – repeating as necessary.

7.4 Limitations of the Study

At various points in this study I have emphasised that the views expressed and judgements made are mine alone, save for those gained from the brief survey, and should be treated as largely subjective. In particular the key statement and observations are derived from my personal involvement in the seven case studies. However, the evaluations made and views expressed are those from being an experienced practitioner over four decades from the most junior to most senior level in a UK maritime emergency response organisation and shipping industry. It must also be said that the case studies appraised for this study are few compared to the many thousands that have occurred worldwide. The 395 responses to my survey of emergency professionals is also a very small sample of the many thousands of those involved in the field. My knowledge and appraisal of cognitive decision making studies is also very limited. Therefore, this study is but a snapshot of maritime emergency activity across my own experiences, those of others, both in the field and in the academic arena.

In this study I have addressed only C4 framework implementation and have not strayed into its many associated areas. For example, the framework as I have described it through my activity map (Chapter 3, Figure 6) could in theory be used by an insurance company to assess whether an organisation in charge of an MME followed the *theory* surrounding a successful implementation of the framework. However, there are several reasons I have not explored this avenue. The first is that the exemplar activity map (Chapter 3, Figure 6) as set out is a theoretical map, albeit one that should result on most occasions in a successful outcome if applied. However, there may be situations when following the activity map to the letter may result in failure – not all frameworks, however good, are infallible in an operational context. The second reason is the reluctance of marine insurers to share information about claims, which would render any research almost impotent. The third reason is simply a matter of time and space within this study.

7.5 Further Research & Application of Findings

Whilst I have identified 46 principles for the improvement in the implementation of the C4 framework and have refined them down to 26 under 3 main and 10 sub-headings, in themselves

they do not improve anything unless they are practiced within an appropriate infrastructure (Capability). For example, ensuring that the right people are recruited and selected for command positions is a matter for further research and discussion to arrive at appropriate HR and other approaches. I am not competent to suggest particular methods for ensuring the right processes but there are many who are, and providing they are advised by MME C4 practitioners I am sure that the right approaches can be found to produce a robust structure.

Many of the principles are self-evident and can be resolved by straightforward improvements in training and knowledge gathering, for example, skills in dynamic risk assessment, decision making and information assimilation leading to options for action and preparedness. This, after all was my intention, to produce principles that would be simple to understand and adopt that would improve the implementation of the C4 framework.

I expressed the view earlier in this study that the principles I have listed, taken as a whole, are neither mutually inclusive nor exclusive even though the C4 framework is a total entity for the management of an MME. However, some principles are dependent upon others and the nature of the MME can dictate the relevant arrangement; I have tried to address this to some extent by my refinement of the original 46 principles. It is possible, therefore, to improve the implementation of the C4 framework by investing in only a small number of principles, and any improvement however small through any of the principles is to be welcomed, as is further research into all the principles themselves, and the exemplar C4 framework as a whole. The evaluation of more case studies in this regard would be particularly helpful, either to reveal new principles or to evaluate the effect those I have identified would have had on the cases in question. A further, and wider, survey of professional practitioners in the wider emergency field would also be welcome.

I would welcome the application of any or all the principles I have derived in this study to an MME and for them to be evaluated in action by other professionals and either contradicted or dismissed as lacking in robustness or in some other way and improved upon. It is only through this process that the implementation of the C4 framework and the management of an MME can be made more successful. In concluding the refinement of the principles I have derived from this study I have produced three tables that comprise all the principles required for a capable emergency response organisation, its readiness and response. The tables have been formulated to enable use by any emergency response organisation, not just in response for an MME.

In closing this study, I have reflected upon what I have learned over four decades and without doubt have found out more about myself and the way in which I developed during career than I knew when I embarked upon the process; reflection is an excellent tool. I have been able, to some extent, to bridge the gap between professional practice and academic literature to produce, what I feel, is a reasonable contribution to the implementation of the C4 framework. I trust also that my endeavours will provide material for all those responsible for the conduct of emergencies across many other non-maritime fields, and I believe that some of my principles, in particular those relating to decision making, can be applied in non-emergency sectors, such as management and business.

References

Abulnour, A.H. 2013, 'Towards Efficient Disaster Management in Egypt' *HBRC Journal 01/2013; 10(2),* viewed 19 December 2015, https://www.researchgate.net/publication/259164655_Towards_efficient_disaster_management_in_Egypt

Adair, J. 2011, *100 Greatest Ideas for Smart Decision Making,* Capstone Publishing, Chichester, UK.

Anderson, H.L, 1986, 'Metropolis; Monte Carlo and the MANIAC', *Los Almos Science,* vol 14, pp. 96-108.

Arbuthot, K., 2008, 'A Command Gap? A Practitioner's Analysis of the Value Comparisons Between the UK's Military and Emergency Services' Command and Control Models in the Context of UK Resilience Operations', *Journal of Contingencies and Crisis Management,* vol.16, Issue 4, pp. 186-194.

Arkes, H.R. & Blumer, C. 1985, 'Sunk Cost', *Organizational Behaviour and Human Decision Processes,* vol.35, pp. 124-140.

Ashton, R. H. & Kennedy, J. 2002, 'Self-Review', *Journal of Behavioural Decision Making,* vol 15, issue 3, pp. 221-231.

Astbury, J., 1987, 'Search Area Determination and Search Unit Deployment', *The Journal of Navigation,* vol 40, issue 01, pp. 63-73.

Astbury, J. 1997, *Focus for Change – HM Coastguard – A 5-year Strategy*, Department for Transport, UK.

Aviation Safety Network, 1996, Mid-air collision SV763, viewed 3 July 2016, https://aviation-safety.net/database/record.php?id=19961112-0

Astbury, J. 2012, Public Works Inventory, DProf Phase 1, Middlesex University, Hendon, UK

Baker, C.C. & Malone, T.B. 2001, 'Ships and Maritime Systems: Requirements and Issues', *Karwowski, W. 2001, The International Encyclopaedia of Ergonomics and Human Factors,* vol. II,. Pp. 956-962, Taylor & Francis, London, UK.

Barnett, C. 1963, *The Swordbearers: Studies in Supreme Command in the First World War,* p35. Hutchinson & Co, London, UK.

Baron, J. 2000, *Thinking and Deciding,* 3rd edn. Cambridge University Press, London, UK.

Bayraktar, E. & Egami, M. 2006, 'The effects of implementation delay in decision making under uncertainty' *The Journal of Stochastic Processes and their Applications'* vol. 117, issue 3, pp333-358.

BBC News, 1980, 'Thatcher 'not for turning', viewed 2 November 2015, http://news.bbc.co.uk/onthisday/hi/dates/stories/october/10/newsid_2541000/2541071.stm

BBC News, 2013, 'Bangladesh factory collapses, toll passes 1000', Viewed 27 June 2016, http://www.bbc.co.uk/news/world-asia-22476774

Beer, S. 1975, *Platform for Change,* John Wiley & Sons Ltd, Baffin Lane, Chichester, England.

Blair, C.A. Gorman, C.A. Helland, K. & Delise, L. 2014, 'The smart leader: examining the relationship between intelligence and leader development behaviour', *Leadership & Organization Development Journal,* vol. 35, issue 3, pp. 241-258.

Bognár A. Barach P. & Johnson J.K. 2008. 'Errors and the burden of errors: attitudes, perceptions, and the culture of safety in paediatric cardiac surgical teams'. *Ann Thorac Surg 2008* vol. 85. pp.1374-1381.

Brehmer, B., 1980, 'In One Word: Not From Experience', *Acta Psychologica,* vol. 45, pp.223-241.

Brickhill, P. *Reach for the Sky: The Story of Douglas Bader DSO, DFC*. Odhams Press Ltd., London

Brockner, J. 1992, 'The Escalation of Commitment to a Failing Course of Action', *Academy of Management Review,* vol. 17, No. 1, pp. 39-61.

Bronson, P. & Merriman, A. 2015, 'Nature Shock: New Thinking About Children', *BigWOWO, Asian American Literature, Ideas and Common Sense,* viewed 6 November 2015, http://www.bigwowo.com/2015/09/nutureshock-new-thinking-about-children-by-po-bronson-ashley-merryman-review/

Cabinet Office UK, 1990, 2010, 'Dealing with Disasters'.

Calhoun, J., 1859, The Works of John C. Calhoun, vol. 6, pp. 143, viewed 6 November 2015, http://oll.libertyfund.org/people/john-c-calhoun

Caligor, E. Levy, K.N. Yeomans, F.E. 2015. 'Narcissistic personality disorder: diagnostic and clinical challenges.' *The American Journal of Psychiatry*, vol. 172 (5), pp. 415–22.

Card, S. Moran, T. P. & Newell, A. 1986. *The Model Human Processor: An Engineering Model of Human Performance.* In K. R. Boff, L. Kaufman, & J. P. Thomas (Eds.), *Handbook of Perception and Human Performance.* Vol. 2. pp. 1–35.

Care Quality Commission, 2016, Southern Health NHS Foundation Trust Quality Report, Viewed 16 July 2016, http://www.cqc.org.uk/sites/default/files/new_reports/AAAF4191.pdf

Carrol, R.T. 2013, The Skepdic dictionary, viewed 6 November 2015, www.Skepdic.com/sunkcost

Carter, C.R., Kaufmann, L., & Michel, A. 2007, 'Behavioural supply management: Integration of human decision making theory into the field of supply management', *International Journal of Physical Distribution and Logistics Management,* Vol 37, issue 8, pp 631-669.

Cattell, R.B. 1990, Advances in Cattellian personality test theory. *L.A Pervin Handbook of Personality: Theory and research,* pp 101-110. New York, USA.

Charan, R. 2006, 'Conquering a Culture of Indecision', *Harvard Business Review,* Jan, pp 108-117.

Checkland, P. & Scholes, J. 2001. *Soft Systems Methodology in Action,* John Wiley & Sons Inc. New York, USA.

Christos Bitas Incident, 1978, Ship Nostalgia, viewed 2 February 2016, http://www.shipsnostalgia.com/showthread.php?t=6977

Coghlin, C. 2013, *Churchill's First War,* Macmillan, London, UK.

Conley, R.E. 1979, 'Military Command and Control (c^2)' in *Signal, Vol 33 No 4, Jan 1979, p 14*

Croson, R, 2005, 'The Gambler's Fallacy and the Hot Hand: Empirical Data from Casinos' *The Journal of Risk and Uncertainty,* vol. 30, issue 3, pp. 195-209.

Cruise Ships and Ocean Liners, 2012, viewed 11 September 2015, http://www.sailwx.info/shiptrack/cruiseships.phtml

Cummins, M. 2015, 'Boredom in the Workplace: A New Look at an Old Problem', *Human Factors: The Journal of the Human Factors and Ergonomics Society*, vol. 58 no. 2. pp. 279-300.

Das, T.K. & Teng, B. 1999, 'Managing Risks in Strategic Alliances' *The Academy of Management Executives Review,* vol. 13, No. 4, pp. 50-62.

Dictionary of Military and Associated Terms, 1989, viewed January 2015, www.dtic.mil

Denzin, N. K. & Lincoln, Y. S. 1998. *Collecting and interpreting qualitative material*. Thousand Oaks, Sage Publication, CA, USA.

Donaldson, J. 1994, (Lord of Lymington), *'Command and Control: Report of Lord Donaldson's Review of Salvage and Intervention and Their Command and Control (Command Paper)',* Her Majesty's Stationary Office (HMSO), ISBN no. 0101419325.

Donaldson, J. 1999, Lord of Lymington, *Review of five year strategy for HM Coastguard: Closure and co-location of co-ordination centres (Command Paper).*Report for the Transport and Regional Affairs Committee Environment. Her Majesty's Stationary Office (HMSO)

Drucker, J.A. 2004,'Maybe we're Asking the Wrong Question (Response to Fehriinger, H.M. (2004) Contributions and Limitations of Cattell's Sixteen Personality Factor Model', *Paper for the Rochester Institute of Technology, Rochester, USA.*

Drucker, J.A. 1986, 'Decision making in a time of crisis: Drucker's recommendations', viewed 6 November 2015, http:// Druckersociety.at/repository/scientific/SaOlao.pdf

Dubois, D. & Rothwell, W. (2004). *Competency-Based Human Resource Management*. Davies-Black Publishing, Mountain View, California, USA.

Dubois, D., & Rothwell, W. (2000). *The Competency Toolkit, (Volumes 1 & 2).* HRD Press, Amherst, MA, USA.

Drillings, M., & Serfaty, D. 1994, 'Naturalistic Decision Making in Command and Control', *US Joint Publication 1-02 (1994) Chap 7, p.78.*

Edenborough, R. 2005, *Assessment Methods in Recruitment, Selection and Performance a Manager's Guide to Psychometric Testing, Interviews and Assessment Centres.* Kogan Page Ltd, USA.

Edwards, R. 1996, '*Sea Empress Environmental Committee: Initial Report, July 1996',* Report to the SEEEC Secretariat, Cardiff, Wales, UK.

Ekman P. 2007. Emotions revealed: Recognizing faces and feelings to improve communication

and emotional life. New York, NY: Holt

Eliot, T.S. 1945, *A Choice of Kipling's Verse made by T.S Eliot,* Faber & Faber Ltd, England UK.

Elliott, Christopher. L. 2014, *High Command, British Military Leadership in the Iraq and Afghanistan Wars,* Hurst Publishing, London, UK.

Epley, N. 2004, 'A Tale of Tuned Decks? - Anchoring as accessibility and anchoring as adjustment' in *D. J. Koehler, & N. Harvey (Eds.), The Blackwell handbook of judgment and decision making*, pp. 240-256. Oxford: Blackwell Publishers, UK

Ericsson, K.A. Krampe, R.T & Tesch-Römer C. 1993, 'The Role of Deliberate Practice in the Acquisition of Expert Performance', *Psychological Review,* vol 100, issue no. 3 pp. 363-406

Evans, Jonathan St. B. T. 1989, Bias in human reasoning: Causes and consequences. Essays in cognitive psychology, *'Bias in human reasoning: Causes and consequences'*. Vol. 9, pp.145. Hillsdale, NJ, England: Lawrence Erlbaum Associates

European Commission Directorate General for Energy and Transport, 2010, '*Improving Passenger Safety (Memo)',* Report to the EUDGfET, European Commission

Fehriinger, H. M. 2004, *Contributions and limitations of Cattell's Sixteen Personality Factor Model*, Paper to the Rochester Institute of Technology, Rochester, USA.

Fenn P. Diacon S. & Gray A. 2000 'Current cost of medical negligence in NHS hospitals: analysis of claims database', *British Medical Journal* vol. 320, pp.1567-1571.

Financial Times, 2015, Financial Times Lexicon, viewed 24 October 2015, http://lexicon.ft.com/

Fisk, A.D. and Schneider, W. 1981. 'Control and automatic processing during tasks requiring sustained attention', *Human Factors*: *The Journal of the Human Factors and Ergonomics Society* vol. 23 no. 6, pp. 737-750

Francisco Franco, 2009, History.com Staff, viewed 18 December 2015, http://www.history.com/topics/francisco-franco

Frensch, P. A. 1994, 'Composition during serial learning: A serial position effect', *Journal of Experimental Psychology: Learning, Memory, and Cognition,* vol. 20, pp.423-442.

Frijda NH. 1988, The laws of emotion. American Psychologist 43: 349-58

Gautier, C, 2015, *The Psychology of Work: Insights into Successful Working Practices*. Kogan Page Ltd, USA.

Gawande, A. (2002), *Complications: A Surgeon's Notes on an Imperfect Science,* Profile Books Ltd, Exmouth, UK.

Gilbert DT. 2006, Stumbling on happiness. New York, NY: Knopf.

Gorovitz, S. & MacIntyre, A., 1976. 'Towards a Theory of Medical Falibility', *Journal of medicine and Philosophy,* vol. 1, pp.51-71.

Gloucestershire Fire & Rescue Service (GFRS), 2015, Integrated Risk Management Plan 2015-18, (IRMP**),** viewed 27 June 2016 http://www.glosfire.gov.uk/index.html.

Green, P. 2007, *Alexander the Great and the Hellenistic Age: A Short History (Universal History),* Modern Library, New York, USA.

Harris, C. 1993, Note to Permanent Secretary Department of Transport Re: MT Braer, Ministerial involvement

Harrison, A. 2003, 'A guide to risk assessment', *Nursing Times,* Vol.99, Issue 09, pp.44.

Harvey, M.R. 2004, *Is the Development of a Hierarchy of Personality From a Flawed Base Trustworthy?* Response Paper to Fehriinger, H.M. 2004, *Contributions and Limitations of Cattell's Sixteen Personality Factor Model*. Paper to the Rochester Institute of Technology, Rochester, USA.

Haws, D. 1990, *Fleets - White Star Line*, Starling Press Ltd.

Health and Safety Executive (HSE), 2015. 'Shift work and fatigue', HSE, Merseyside, UK. Viewed 1 July, 2016. http://www.hse.gov.uk/toolbox/organisation/shiftwork.htm

Healy, P.M. & Palepu, K.G. 2000, 'Information asymmetry, corporate disclosure, and the capital markets: a review of the empirical disclosure literature', *Journal of Accounting and Economics,* 31(2001), pp. 405-440.

Heck, A. 2004. StarBriefs Plus. *A Dictionary of Abbreviations, Acronyms and Symbols in Astronomy and Related Space Sciences.* Kluver Academic Publishers, South America.

Herald of Free Enterprise, 1987, Flooding and Capsize of ro-ro passenger ferry Herald of Free Enterprise, MAIB Formal Investigation, Report MSA1894, March 1987, Department for Transport, London, UK.

Hicks, P. & Astbury, J. 1986, Computerised Search Area Determination, An Alternative Approach, Paper in support of computerised search planning, Portsmouth University & Highcliffe Coastguard Training Centre.

HM Coastguard Operational Management System (OMS), 2010, viewed regularly 12 May 2012 to 24 September 2015, http://oms.mcga.gov.uk/

HM Coastguard The Recruitment Cycle, 2014, Maritime & Coastguard Agency, Department for Transport, UK

Hogarth, R.M. 1987, *Judgement and Choice,* 2nd Edn. Wiley, UK

Home Office, 1998, *Dealing with Disasters,* 3rd edition, HMSO, London, UK

Inquiry into the fire on Heavy Goods Vehicle shuttle 7539 on 18 November 1996, viewed 23 October 2013, http*://www.railwaysarchive.co.uk/documents/CTSA_ChanTun1996.pdf*

International Aeronautical & Maritime Search and Rescue Manual, 2007, vol. I-III, IMO/ICAO, London/Montreal.

Investigating Clinical Incidents in the NHS, 2015. House of Commons Public Administration Select Committee, Sixth Report of Session 2014-2015, The Stationary Office, London, UK.

IMO Maritime Safety Committee, 51st Session, 1985, *Standard Marine Navigational Vocabulary*, IMO Publications, London, UK.

International Maritime Organisation (IMO), 1974, *International Convention for the Safety of Life at Sea (SOLAS),* IMO, London, UK.

IMO Membership List, http://www..imo.org/About/Membership/ , viewed 17 September 2015.

Jackson, P. 1998, *Introduction To Expert Systems* (3 ed.), Addison Wesley, p. 2.

Janis, I.L. 1972, *Victims of Groupthink,* Houghton Mifflin, New York, USA.

Janis, I.L. 1982, *Groupthink: Psychological Studies of Policy Decisions and Fiascos,* Wadsworth Cengage Learning, Boston, MA, USA.

Johns, M. 2006, 'Sea of Change', in *Exchange*, Issue 2, Hampshire Fire and Rescue Service Magazine, Hampshire, UK.

Kahle, J.B. & White, R.A. 'Tax Professional Decision Biases: The effects of initial beliefs and client preferences, *Journal of the American Taxation Society,* vol. 26, Issue s-1, pp. 1-29.

Kahneman, D. 2011, *Thinking, Fast and Slow*, Penguin Books Limited, London, England.

Kahneman, D. & Tversky, A. 1972, 'Subjective Probability: A Judgement of Representativeness' *Cognitive Psychology* 3 pp. 430-454.

Kahneman, D. Slovic, P. & Tversky, A. 1982, *Judgement under Uncertainty,* Cambridge University Press, London, UK.

Kahneman, D. & Tversky, A. 1979, *Prospect Theory: An analysis of decision under risk,* Cambridge University Press, London, UK.

Karwowski, W. 2001, International Encyclopaedia of Ergonomics and Human Factors, Taylor & Francis, London, UK.

KASE, 2011. Kase Corporate Presentations as of 1.06.2011. Viewed 2 February 2016. http://www.kase.kz/files/presentations/ru/11_06_01_KASE_ru.pdy

Katrina, 2015, viewed 12 September 2015, *http://katrina.com*

Keltner, D. & Lerner J.S. 2010, Emotion. In *The Handbook of Social Psychology*, ed. DT Gilbert, ST Fiske, G L, pp. 317-52. New York, NY: Wiley

Keltner, D., Oatley K. & Jenkins J.M. 2014. *Understanding emotions*. Hoboken, NJ: Wiley

Kenny, D.A. & DePaulo, B.M. 1993, 'Do people know how others view them? An empirical and theoretical account', *PubMed,* accessed 6 November 2015, http://www.ncbi.nlm.nih.gov/pubmed/8346325

Kets de Vries, M. 2014, '11 Leadership Lessons from Alexander the Great', accessed 6 November 2015, http://knowledge.insead.edu/blog/insead-blog/11-leadership-lessons-from-alexander-the-great-3697

Keynes, R.J, 1990, *Cockpit Resource Management – A new approach to aircrew training.* Paper to the Airspace Research Institute, Alabama, USA.

Koehler, D.J. & Harvey, N. (Eds) 2004, *The Blackwell Handbook of Judgement and Decision Making,* Willey-Blackwell, UK

Kruger, J. & Dunning, D.1999. 'Unskilled and Unaware of It: How Difficulties in Recognizing One's Own Incompetence Lead to Inflated Self-Assessments'. *Journal of Personality and Social Psychology* **77** (6): 1121–34.

Last, S. 1999, 'Eliminating "Cockpit-Caused" Accidents, Error-tolerant Crew Procedures for the Year 2000' *Neil Kreys CRM Developers,* viewed 23 August 2015, http://s92270093.onlinehome.us/CRM-Devel/resourcess/paper/last

Lauter, D. 1993, 'Clinton's Decision-Making Style Keeps Capital Waiting: Presidency: He invariably delays key moves until the last minute. Aides say process helps avoid mistakes', *Los Angeles Times,* 9 February, 1993.

Law, K.S. Wong, C. & Mobley, W.H. 1998, 'Toward Taxonomy of Multidimensional Constructs', *Academy of Management Review,* vol.23, no.4, pp.741-755.

Laxisman, A., Hakimzada, F., sayan, O.R.,Green, R.A., Zhang, J., Patel, C.L. (2007), 'The multitasking clinician: Decision-making and cognitive domain during and after team handoffs in emergency care. *International Journal of Medical Information*, vol 76 pp. 801-811.

Lazarus, R.S. 1991, *Emotion and Adaptation*. New York, NY: Oxford University Press.

Leemann, J.T. 2014, 'Why do we break the rules?' *Industrial Safety & Hygiene News*, Viewed 17 July 2016, http://www.ishn.com/articles/99188-why-do-we-break-the-rules

Loewenstein G, & Lerner JS. 2003. The role of affect in decision making. Handbook of Affective Sciences, ed. RJ Davidson, KR Scherer, &HH Goldsmith, pp. 619-42. New York, NY: Oxford University Press

Loewenstein G., Weber E. U., Hsee C. K., &Welch N. 2001. 'Risk as feelings', Psychological Bulletin 127: 267-86

Loh, V. 2013, This Lawyers Advice: Learn from the Mistakes of others, The Globe and Mail, viewed 2 February 2016, http://www.theglobeandmail.com/report-on-business/careers/career-advice/this-lawyers-advice-learn-from-the-mistakes-of-others/article4582877/

Lundberg, G.D., 1998. 'Low-tech autopsies in the era of high-tech medicine: continued value for quality assurance and patient safety', Medline, viewed 1 July 2016, http://www.ncbi.nlm.nih.gov/pubmed/9786381

Mackworth, J.F. 1969 Vigilance and Habituation. Baltimore MD: Penguin

Mackworth, N.H. 1948. The breakdown of vigilance during prolonged visual search, Quarterly Journal of Experimental Psychology, vol.1, pp. 6-21

Mahwah, N.J. 2007, *Culture & Organisation,* Abingdon Publishers, Oxfordshire, UK.

Marchioness and Bowbelle Collision, 1991, MAIB Report, Department of Transport, UK, viewed 18 December 2015, https://www.gov.uk/maib-reports/collision-between-aggregates-dredger-bowbelle-and-passenger-vessel-marchioness-on-the-river-thames-england-resulting-in-marchioness-sinking-with-loss-of-51-lives

Marusich, L.R., Bakdash, J.Z., Onal, E., Yu, M.S., Schaffer, J., O'Donavan, J., Höllerer, T., Buchler, N., & Gonzalez, C., 2016, 'Effects of Information Availability on Command-and-Control Decision Making: Performance, Trust, and Situation Awareness', *Journal of the Human Factors and Ergonomics Society,* Vol. 58, No 2, pp 301-321.

Mattinson, C. 2011, Today's Political Leaders are all in Winston Churchill's Shadow, in *The Observer 6 December 2011,* viewed 15 December 2015*http://www.theguardian.com/politics/2015/dec/06/britainthinks-political-leaders-shadow-winston-churchill*

MCA, 2010, 'Protecting *our Seas and Shores in the 21st Century: Consultation on proposals for modernising the Coastguard',* Department for Transport, UK.

MCA, 1999, '*The Multitank Ascania Incident, A report by the Maritime and Coastguard Agency',* Department for Transport, UK.

Maule, A. J. & Edland, A. C. 1997. 'The effects of time pressure on human judgement and decision making', R. Ranyard, R. W. Crozier & O. Svenson (Eds.), *Decision making: Cognitive models and explanations.* Routledge, London and New York.

Mazars Report, 2016, Independent review of deaths of people with a Learning Disability or Mental Health problem in contact with Southern Health NHS Foundation Trust April 2011 to March 2015

Mitchell, T., & Thompson, L. 1994, 'A theory of temporal adjustments of the evaluation of events: Rosy Prospection & Rosy Retrospection', in C. Stubbart, J. Porac & J. Meindl (Eds.), *Advances in managerial cognition and organizational information-processing*, Vol. 5, pp. 85-114, Greenwich, CT: JAI Press

Morgenstern, J. 2016, 'Cognitive Errors in Medicine: the common errors', *First10EM, World Press.com, https://first10em.com/2015/09/15/cognitive-errors/* viewed 27 June, 2016.

Multitank Ascania, 1999, MAIB Report, Department of Transport Report No.22/2000, viewed 18 December 2015, https://assets.digital.cabinet-office.gov.uk/media/547c718740f0b6024400012d/multitank_ascania.pdf

National Communications Association (NCA) 2015, 'What is Communication?' viewed 25 July 2015, https://www.natcom.org/discipline/

National Transportation Safety Board (NTSB), 2009. Loss of Thrust in Both Engines After Encountering a Flock of Birds and Subsequent Ditching on the Hudson River US Airways Flight 1549 Airbus A320-214, N106US Weehawken, New Jersey, viewed 28 June, 2016, http://www.ntsb.gov/investigations/AccidentReports/Reports/AAR1003.pdf

Nisbett, R.E., & Ross, L. 1980. *Human Inference: Strategies and Shortcomings of Social Judgement.* Eastwood Cliffs, NJ: Prentice-Hall, USA.

Norrington, L. Quigley, J., Russell, A. & Van der Mer, R. 2008, 'Modelling the Reliability of search and rescue operations with Bayesian Belief Networks (BBN)', *Science Direct, Reliability Engineering and Systems Safety,* vol 93, pp 940-949.

Nuttgens, C. & Austin-Hancock, A. 2001, Maritime and Coastguard Agency Better Quality Services Review of Search and Rescue, Report by Basis Limited, London, UK

Ogilvy, D.M, 1983, *Ogilvy on Advertising,* Carlton Publishing, London, UK

O'Mathúna, D.P. 2010, 'Conducting Research in the aftermath of disasters: ethical considerations', *Journal of Evidence Based Medicine,* vol.3, Issue 2, pp. 65-75.

Operation Tempest, 2007.Viewed 12 August 2013, http://news.sky.com/story/1097408/april-jones-search-was-polices-largest-ever

Ordóńez, L.D. & Benson, L. 1997, 'Decisions Under Time Pressure: How Time Constraint Affects Risky Decision Making' viewed on 7 November 2015, http://www.researchgate.net/publication/4819432_Decisions_Under_Time_Pressure_How_Time_Constraint_Affects_Risky_Decision_Making

Orwell, G. 1949, *Nineteen Eighty-Four,* Secker & Warburg, London, UK

Oxford English Dictionary, 2014.Viewed 1 September 2015, http://www.oxforddictionaries.com/definition/english

Oyebode, F. 2013, 'Clinical Errors and Medical Negligence', *Medical Principles and Practice,* Vol.2, No. 4, pp. 323-333.

Parasuraman, R. 1979. 'Memory load and event rate control sensitivity decrements in sustained attention', *Science,* vol. 205(4409), pp. 924-927.

Payne, J.W. 1976, 'Heuristic search processes in decision making' in B.B. Anderson (Ed.), *Advances in Consumer Research,* vol. 3. (Proceedings of the Sixth Annual Conference of the Association for Consumer Research).

Pickup, L., Lowe, E. & Smith, S. 2014, 'Vigilance Evidence and the Railway Lookout', in Sharples, S. & Shorrock, S.T. 2014, *Contemporary Ergonomics and Human Factors,* CRC Press, New York, USA.

Pigeau, R. & McCann, C. 2002, 'Re-conceptulalizing Command and Control', *Canadian Military Journal,* pp 53-64.

Plous, S. 1993, *The Psychology of Judgement and Decision Making,* McGraw-Hill, New York, USA.

Psychometric Success, Frequently asked questions, 2013, viewed 11 September 2015, http://www.psychometric-success.com/faq/psychometric-tests-faq.htm

Rail Accident Investigation Board (RAIB), 2011. 'Track Worker Struck at Cheshunt Junction', RAIB Report 06/2011, Department for Transport, UK.

Rail Accident Investigation Board (RAIB), 2015. 'Near miss involving track workers near Hest Bank, Lancashire, RAIB Report 08/2015, Department for Transport, UK.

Rasmussen, J. 1983. Skills, rules, knowledge: signals, signs, and symbols, and other distinctions in human performance models. *IEE Transactions: Systems, Man and Cybernetics.* SMC vol. 13, pp 257-67.

Reason, J.T., 1990. Human Error. Cambridge University Press, Cambridge, UK.

Reason, J.T, 2013, A life in error: from little ships to big disasters, Ashgate Publishing, Surrey, England.

Reason, J.T, 2000, 'Human error: models and management', BMJ Vol. 320, viewed 29 June, 2016, BMJ Vol. 320, pp. 768-770, http://www.bmj.com/content/320/7237/768

Register of Debates in Congress, 1824-1837, accessed 6 November 2015, http://memory.loc.gov/ammem/amlaw/lwrd.html

Reibstein, R. 2005, 'Preventative Preparedness', *Online Journal InterScience,* viewed 5 November 2015, www.interscience.wiley.com

Richards, D. 2014, *Autobiography, Taking Command,* Headline Publishing Group, UK. ISBN 978 1 4722 2084.

Riessman, C.K. 1993, *Narrative Analysis (Qualitative Research Methods),* SAGE Publications, London UK.

Robins, N. 1995, *The evolution of the British ferry,* p. 89, Kilgetty: Ferry Publications, Wales, UK.

Roese, N.J. & Vohs, K.D. 2012. 'Hindsight Bias', *Perspectives on Psychological Science, A Journal of the Association of Psychological Science,* http://pps.sagepub.com/content/7/5/411.abstract#aff-1 viewed 27 June, 2016.

Rogovin, M. & Frampton, G.T, 1980. Three Mile Island, A report to the Commissioners and the Public, vol 1, Nuclear Regulatory Commission Special Inquiry Group, USA.

Rozakis, M. 2007, 'The cultural context of emergencies', *Disaster, Prevention and Management: An International Journal,* vol.16, issue 2, pp. 201-209.

Rozinskiy, Z.2014, How to Select the Right People, InfoQueue, viewed 15 July 2015, http://www.infoq.com/articles/select-right-people-outsourcing,

Russo, J.E. & Shoemaker, P.J.H. 1992. 'Managing Overconfidence', *MIT Sloane Management Review,* Magazine: Winter 1992.

Sage, L.G. 1981, 'The Gambler's Fallacy', in Carey, J.M. 1988, *Human Factors in Management Information Systems,* pp. 86, Ablex Publications, USA.

Scherer, K.R. & Ekman, P. eds. 1984. Approaches to emotion. Hillsdale, NJ: Erlbaum

Schwenk, C.R. 1984, 'Cognitive simplification processes in strategic decision-making', *Strategic Management Journal*, vol 5. Issue 2, pp. 118-128.

Sharon, C. 2007, 'Thinking is Hard Work' viewed 5 November 2015, https://**colleensharen**.wordpress.com/author/c**sharen**/page/20/

Sharples, S. & Shorrock, S.T. 2014, *Contemporary Ergonomics and Human Factors,* CRC Press, New York, USA.

Shaw, A.D. 1980, 'Command, Control and Communications, in *Scientia Militaria, South African Journal of Military Studies, vol 10, No. 3.*

Shipping and World Trade, 2010, viewed 26 June 2012, http://www.marisec.org/shippingfacts/worldtrade/volume-world-trade-sea.php

Shoemaker, P.J.H. & Russo, J.E. 2001, *Winning Decisions,* Doubleday, New York, USA.

Slade, D. Manidis, M., McGregor, J. Scheres, H., Chandler, E. Stein-Parbury, J., Dunstor, R., Herke, M. & Mathiessen, C.M.2015, *Communicating in Hospital Emergency Departments*, Springer, New York, USA.

Social Science Statistics Z Test Calculator, viewed 26 May 2016, http://www.socscistatistics.com/tests/ztest/

Soman, D. 2004, 'The Effect of Time Delay on Multi-attribute Choice', J*ournal of Economic Psychology,* Issue 25, pp. 153-175.

Spangler, B. 2003, 'Beyond Decision Making', viewed 3 November 2015, http://www.beyondintractability.org.

Stainburn, S. 2014, 'Bringing Competency-based Learning to Life', *Education Week,* vol 33, Issue 33, pp 14-15.

Stanton, N.A. Baber, C. & Harris, D. 2008*Modelling Command and Control: Event analysis of systemic teamwork,* Ashgate Publishing Ltd, London, UK.

Staw, B.M. 1976, 'Knee deep in the big muddy: A study of escalating commitment to a chosen course of action', *Organizational Behaviour and Human Performance,* vol 16, issue 1, pp. 27-44.

Stockholm Agreement, 2003. 'Agreement Concerning Specific Stability Requirements for Ro-Ro Passenger Ships Undertaking Regular Scheduled International or Domestic Voyages between European Ports', Merchant Shipping Notice 1790 (M), Maritime & Coastguard Agency

Taiwan TransAsia flight GE235 plane crash report, viewed 27 August 2015,http://www.ibtimes.co.uk/taiwan-transasia-flight-ge235-plane-crash-report-wow-pulled-back-wrong-side-throttle-said-1509000

The Coastguard, Emergency Towing Vessels and the Maritime Incident Response Group, 2010, Transport Select Committee, Session 2010 (12), viewed 19 December 2015, http://www.publications.parliament.uk/pa/cm201012/cmselect/cmtran/writev/maritime/m02a.htm

The Costa Concordia, 2012,*The Guardian*, viewed 28 April 2012,http://www.guardian.co.uk/world/costa-concordia

The Guardian, 2013, 'The girl who died of meningitis was misdiagnosed by two doctors', https://www.theguardian.com/uk/2013/apr/04/girl-meningitis-seen-doctors-death viewed 27 June, 2016.

The New Delay over Airport Expansion Reveals Lack of Leadership, 2015, in *Financial Times,* viewed 15 December 2015, http://www.ft.com/cms/s/0/5bebfa9a-a023-11e5-8613-08e211ea5317.html#axzz3uOr10ylY

The Open University, 1990, *Systems, Management & Change, an honours level course,* Open University Press, Milton Keynes, UK.

The Open University, 2004, 'The Big Question Team', viewed 3 November 2015, http://www.open.edu/openlearn/history-the-arts/history/can-we-trust-history

The Scopjean arguments on the mother-tongue of Alexander the Great, viewed 6 November 2015, www.cc.ece.ntua.gr/~conster/English/PageData/scopjeans_m_d.htm

Tupes, E.C. & Christal, R.E. 1961, 'Recurrent personality factors based on trait ratings' *USAF ASD Tech.Rep. No. 61-97.* Lackland Air Force Base, Texas, USA.

Twinning, W. 1985. *Theories of Evidence: Bentham & Wigmore,* p.135, Stanford University Press, Stanford, California, USA.

Types of Psychological Complexes, 2011, *Analytical Psychology and Psychoanalysis,* April 2011, viewed 9 December 2015, https://analyticalpsychology.wordpress.com/

Yates, J.F. 1990, *Judgement and Decision Making,* Englewood Cliffs, Prentice Hall, NJ, USA.

Youtube, 2011, 'Shame on FYRoM Professor', viewed 4 November 2015, https://www.youtube.com/watch?v=jOdcZEq45sY

Vaile, J.C. &Griffith, M.J. 1997, 'Management of asymptomatic stenosis: masterly inactivity but cat-like observation', *Heart,* September 1997 78(3), pp 215-217.

Van Kleef, G.A. Homan, A.C. Finkenauer, C. Gundemir,S. Stamkou, E., 'Breaking the Rules to Rise to Power: How Norm Violators Gain Power in the Eyes of Others' *Social Psychological and Personality Science*, Viewed 17 July 2016, https://www.sciencedaily.com/releases/2011/05/110520092735.htm

Van de Ven, N., Gilovich, T. & Zeelberg, M. 2010, ' Delay Doubt, and Decision: How Delaying a Choice Reduces the Appeal of (Descriptively) Normative Options', *Psychological Science* 21 (4) pp. 566-573.

Vassalos, D. & Papanikolaou, A. 2001, 'Stockholm Agreement – Past, Present & Future (Parts I & II)*'Report for the The Ship Stability Research Centre, Department of Ship and Marine Technology*, Glasgow, UK and *National Technical University of Athens, Ship Design Laboratory*, Greece.

Virine, L. & Trumper, M. 2008, *Project Decisions – The Art and Science,* Management Concepts Inc., Vienna, VA. USA.

Wallace, J.C. Vodanovichb, S.J. & Restino, B.M., 2003. Predicting Cognitive Failures from Boredom Proneness and Daytime Sleepiness Scores: an Investigation within Military and Undergraduate Samples. *Personality and Individual Differences*, vol. 34. Pp. 635-644.

Walker, G**.,** Neville A., Stanton, N.A., Salmon, P.M. & Jenkins, D.P. 2009, *Command and Control: the sociotechnical perspective.* Ashgate Publications Ltd, London, UK.

Which Magazine, 2014, 'Home & Energy', viewed 5 November 2015, www.which.co.uk

Wilcox, M. & Jenkins, M. 2015, *A People-centred Approach to Business,* Kegan Page, London, UK.

World Health Organisation (WHO), 2008, Implementation Manual- WHO Surgical Safety Checklist (First Edition), WHO World Press, World Health Organization, Geneva, Switzerland.

Yates, J.F. 1990, *Judgement & decision making,* Prentice-Hall, New York, USA.

Zambok, C.E & Klein, G. 1997, *Naturalistic Decision Making,* Routledge, New York, USA.

References specific to the PWI MT Prestige (as documented and referenced in Court Disclosures and European Testimonials)

(Translation: Tomo = volume. Pieza= Part. Documental = Document)

Addendum to the Report on the Prestige Accident in the Finisterre Traffic Separation Scheme on 13 November 2002, dated May 2005 (Tomo Principal 25, page 10757).

Annex 3.2 to the DGMM Report, 2003, - *Helimer Galicia SAR Operating Report* (Pieza Documental 6, Tomo 1, page 450).

Annex 3.4 to the DGMM Report, 2003, - *Ria de Vigo Contract* (Pieza Documental 6, Tomo 1, pages 464-502).

Annex 6.3 to the DGMM Report, 2003,- *Minutes of the 3rd meeting of the Governing Body at 13.00 on the 14th* (Pieza Documental 6, Tomo 2, page 1103).

Annex 6.8 to the DGMM Report, 2003, - *Minutes (2) of the Meeting of a group of experts held on the 19th* (Pieza Documental 6, Tomo 2, page 1121).

Annex 6.8 to the DGMM Report, 2003, - *Minutes (2) of the Meeting of a group of experts held on the 19th* (Pieza Documental 6, Tomo 2, page 1123).

Annex 8.3 to the DGMM Report. 2003, - *Fax from the Madrid MRCC to the National Institute of Meteorology on 13 November 2002 at 1757* (Pieza Documental 6, Tomo 2, page 1360).

CEDRE (Centre de Documentation, de Recherche et d'Expérimentations sur les pollutions accidentelles des eauxalsoknown as Centre of Documentation, Research and Experimentation on Accidental Water Pollution), *Slickdrift observations and forecast* and *Involvement of CEDRE,* viewed 12 July 2011,http://www.cedre.fr/en/spill/*Prestige*

CEDRE, *Slick drift observations and forecast* and *Involvement of CEDRE*, viewed 12 July 211, http://www.cedre.fr/en/spill/*Prestige*

Fax from the French Atlantic Maritime Prefecture to the Madrid MRCC dated 14 November 2002 at 1259 (Tomo Principal 28, page 12357).

Fax from SMIT (Richard Janssen) to Universe Maritime dated 13 November 2002 (Tomo Principal 4, page 1343).

Fax from SMIT (Richard van der Werf/Richard Janssen) to Mare Shipping care of Universe Maritime (Captain Margetis) dated 14 November 2002 (Tomo Principal 4, page 1363).

Fax to Mr Uribe from Vice Admiral Jacques Gheerbrant, undated but believed to have been sent on 14 November 2002 (Pieza Documental 25, Tomo 28, page 25545).

Incidents Involving the 1992 Fund 92FUND/EXC.21/3/1 dated 1 May 2003 – Management of the Crisis by the Spanish Authorities paragraph 1.1 (2) (Documents submitted on behalf of Mare Shipping Inc and Captain Mangouras, File 21 , page 6378).

ITOPF Report, 2003, (Tomo Principal 77 (I), page 41080).

ITOPF Fund Document 92FUND/EXC.21/3/1, 2003, cited in the Helimer Galicia ITOPF Report (Tomo Principal 77 (I), page 41080).

ITOPF Ocean Orbit Newsletter dated March 2003 (Documents submitted on behalf of Mare Shipping Inc and Captain Mangouras, File 19, page 5878).

MARE Delegation to Barcelona: exchange of views with Prestige captain, 4-5 February 2004 (Tomo Principal 79, page 41788).

Madrid MRCC, *Transcription and translation of telephone conversations related to the Prestige dated 13 November 2002*, volume 1 of 2, conversation 13-16 between the Finisterre MRCC and the Madrid MRCC (Pieza Documental 12, page 29).

Madrid MRCC, *Transcription and translation of telephone conversations related to the Prestige dated 13 November 2002*, volume 1 of 2, conversation 13-25 between the Head of the MRCC and the DISSC (Pieza Documental 12, page 41).

Madrid MRCC, *Transcription and translation of telephone conversations related to the Prestige dated 13 November 2002*, volume 1 of 2, conversation 13-15 between the Director General of the Merchant Marine and the Head of the Madrid MRCC (Pieza Documental 12, page 26).

Madrid MRCC, *Transcription and translation of telephone conversations related to the Prestige dated 13 November 2002*, volume 1 of 2, conversation 13-15 between the Director General of the Merchant Marine and the Head of the Madrid MRCC (Pieza Documental 12, page 23-24).

Madrid MRCC, *Transcription and translation of telephone conversations related to the Prestige dated 13 November 2002*, volume 1 of 2, conversation 13-20 between the DGCP and the Head of the MRCC (Pieza Documental 12, page 35).

Madrid MRCC, *Transcription and translation of telephone conversations related to the Prestige dated 13 November 2002*, volume 1 of 2, conversation 13-15 between the Director General of the Merchant Marine and the Head of the Madrid MRCC (Pieza Documental 12, pages 25-26).

Madrid MRCC, *Transcription and translation of telephone conversations related to the Prestige dated 13 November 2002*, volume 1 of 2, conversation 13-3 between the Madrid MRCC and the Department of Merchant Marine (Pieza Documental 12, page 6).

Madrid MRCC, *Transcription and translation of telephone conversations related to the Prestige dated 13 November 2002*, volume 1 of 2, conversation 13-15 between the Director General of the Merchant Marine and the Head of the Madrid MRCC (Pieza Documental 12, page 24).

Madrid MRCC, *Transcription and translation of telephone conversations related to the Prestige dated 13 November 2002*, volume 1 of 2, conversation 13-57 between the Head of the MRCC and the Head of the Finisterre MRCC (Pieza Documental 12, page 87).

Madrid MRCC, *Transcription and translation of telephone conversations related to the Prestige dated 13 November 2002*, volume 1 of 2, conversation 13-33 between Finisterre MRCC and the Madrid MRCC (Pieza Documental 12, page 52).

Madrid MRCC, *Transcription and translation of telephone conversations related to the Prestige dated 13 November 2002*, volume 1 of 2, conversation 13-63 between the Madrid MRCC and the Gijon MRSC (Pieza Documental 12, page 98).

Madrid MRCC, *Transcription and translation of telephone conversations related to the Prestige dated 13 November 2002*, volume 1 of 2, conversation 13-35 between the Director General of the Merchant Marine and the Madrid MRCC (Pieza Documental 12, pages 55-56).

Ministry for the Environment's Marine Meteorology Report for the period of the *Prestige* Incident dated 20 January 2003 (Tomo Principal 3(2), pages 1111-1113).

National Maritime Rescue Co-ordination Centre (Madrid MRCC), *Transcription and translation of telephone conversations related to the Prestige, dated 13 November 2002*, volume 1 of 2, conversation 13-74 between the Madrid MRCC and the Spanish Meteorological Office (Pieza Documental 12, page 116).

Pieza Documental 6, Tomo 1, page 76.Statement of Mr Guillaume Lambert (Naval Commander at the French Atlantic Maritime Prefecture) to the Maritime Police Force of Brest dated 7 July 2003 (Pieza Documental 25, Tomo 28, page 25799).

Report to the European Commission (EC) from the Directorate General for Merchant Shipping at the Spanish Ministry of Public Works on Maritime Safety, the Accident to the "Prestige" and Subsequent Action, dated 7 March 2003 (Documents submitted on behalf of Mare Shipping Inc and Captain Mangouras, File 19, page 5935).

Statement of Vice Admiral Jacques Gheerbrant to the Maritime Police Force of Brest dated 25 June 2003 (Pieza Documental 25, Tomo 9, pages 7625-7626).

Statement of Mr Guillaume Lambert to the Maritime Police Force of Brest dated 7 July 2003 (Pieza Documental 25, Tomo 28, page 25798).

Statement of Mr Serafin Diaz Regueiro to the Corcubion Court dated 28 November 2002 (Tomo Principal 1(3), pages 278-282). *Assessment of probable pollution damage which would have resulted had there been no further cargo loss after 13 November 2002* dated 9 May 2003 (ITOPF Report) (Tomo Principal 77 (I) pages 41080-41082).

Statement of Mr Martínez Mayan to the DGMM dated 9 January 2003 (Pieza Documental 6, Tomo 1, page 155).

Statement of Mr Landeira Regueiro to the DGMM dated 9 January 2003 (Pieza Documental 6, Tomo 1, pages 158-159).

Statement of Mr Descalzo Cristiano to the Spanish Court dated 10 September 2008 (Tomo Principal 80, page 42432).

Statement of The Director to the Court of Corcubion dated 2-3 April 2003 (Tomo Principal 6, page 2000).

Statement of Salvage Master taken at Rotterdam dated 11 August 2003 (Tomo Principal 152 – Escritos Defensa, pages 97287-97288).

The Master's statement to the European Parliament, 2003, undated (Pieza Documental 25, Tomo 4, page 4275).

Transcripts for telephone number 900202202 and VHF channels 11 and 16, 2002, (Tomo Principal 29, pages 12823-12848, 12956-13003 and 12849-12881 respectively).

Transcripts for telephone number 900202202 and VHF channels 11 and 16, 2002, (Tomo Principal 29, pages 12823-12848, 12956-13003 and 12849-12881 respectively).

Transcription and translation of telephone conversations related to the Prestige, dated 14-15 November 2002 (Pieza Documental 12, pages 249-416 and 417-636 respectively), fax from SMIT (Geert Albert Koffeman, Smit Commercial Director (G A Koffeman)) to the Director General received at 12:11:52 on 15 November 2002 & Pieza Documental 6, Tomo 2, pages 1306-1307) & statement of G A Koffeman obtained by the French investigating judge dated 15 May 2003 (Pieza Documental 25, Tomo 9, pages 7540-7541).

Transcript for VHF channel 16 at 1717 UTC (Tomo Principal 29, page 12863).
Transcript for telephone number 981767738 at 1725 UTC (Tomo Principal 29, pages 12573-12574).

Transcript for VHF channel 11 at 2001 UTC, 2002,(Tomo Principal 29, page 12963).

Transcript for VHF channel 11 at 1703 UTC on 14 November 2002, conversations between the *Prestige* and Finisterre Traffic (Tomo Principal 29, page 12988).

Transcript for VHF channel 11 at 1746 and 1751 UTC on 14 November 2002, conversations between the Finisterre MRCC and the Helimer Galicia (Tomo Principal 29, page 12989).

Transcript for VHF channel 16, 2002,(Tomo Principal 29, pages 12854-12855).
MARE Delegation to Barcelona: exchange of views with Prestige captain, 4-5 February 2004 (Tomo Principal 79, page 41788).

Transcript for telephone number 900202202, 2002, (Volume 29, page 12847).

Bibliography

Alberts, D.S. & Hayes, R.E. 2003, 'Power to the Edge. Command…Control… in the Information Age', *Assistant Secretary of Defense (C3I/Command Control Research Programme) Washington DC, USA.*

Alberts, D.S. & Hayes, R.E., 2006, 'Understanding Command and Control'*, Assistant Secretary of Defense (C3I/Command Control Research Programme) Washington DC, USA.*

Artman, H. & Wærn, Y., 1999, 'Distributed Cognition in an Emergency Co-ordination Center', in *Computer Science: Cognition, Technology & Work, vol.1, no. 4, pp. 237-246*

Athens, M., 1987, 'Command and Control (C2) Theory: a challenge to control science', in *Automatic Control,* Vol.32, Issue 4. pp. 286-293.

Bell, D.E, Raiffa, H. & Tversky, A. 1988, *Decision making*, Antony Rowe Limited, Chippenham, Wiltshire, England.

Bell, J. 2010, *Doing Your Research Project, A guide for first-time researchers in education, health and social science,* fifth edn., Open University Press, Maidenhead, England.

Bracken, P. 1983, '*The Command and Control of Nuclear Forces'*, World Future Society, Bethesda, USA.

Bryant, D.J., Webb, R.D.G. & McCann, C. ' Synthesizing Two Approaches to Decision Making in Command and Control' *National Defence and the Canadian Forces*, Viewed 28 August 2015,http://www.journal.forces.gc.ca/vo4/no1/command

Buchanan, T.H., Galpin, J.J, Hillman, J.L., Leonard, R.R. & Nolen, J.M. 2006, 'Enabling Effective Decisions', *Johns Hopkins APL,* Report OMB No. 0704-0188.

Builder, C.H. , Banes, S.C. & Nordin, R. 1999, *Command Concepts – A Theory Derived from the Practice of Command and Control,* RAND, 1700 Main Street, Santa Monica, USA.

Coakley, T.P. 2012, *Command and Control for War and Peace,* University of California, USA.

Colton, K.W., Brandeau, M.L. & Tien, J.M. 1983, Report: 'The National Assessment of Police Command, Control, and Communications Systems', *Public Systems Evaluation, Inc, USA*.

'Command, Control, and Communications', 2000. Field Manual, no. 3.04.5000, Department of the Army, Washington, DC, USA, Chap. 3 Sec. I & II

Costley, C., Elliott, G. & Gibbs, P. 2010, *Doing Work Based Research, Approaches to Enquiry for Insider-Researchers,* Sage Publications Limited, London, England.

Crichton, M.T., Lauche, K. & Flin, R. 2005, 'Incident Command Skills in the Management of an Oil Industry Drilling Incident: a Case Study', *Journal of Contingencies and Crisis Management,* vol. 13, Issue 3, pp.116-128.

Cropsey, L.C.G, 2009. 'Finding Common Ground: A Value-Focused Approach to Military UAS Airspace Integration' AUVSI Unmanned Systems Europe 2009, La Spezia, Italy, April 20-22, 2009.

Crow, J., Smith, L., &Keenan, I. 2006, 'Journeying between the Education and Hospital Zones in a collaborative action research project', *Educational Action Research,* vol. 14, no. 2, pp. 287-306.

D'Abate, C.P, Eddy, E.R. &Tannenbaum, S.I. 2003, 'What's in a Name? A Literature-Based Approach to Understanding Mentoring, Coaching, and other Constructs That Describe Development Interactions', *Human Resource Review,* vol. 2, no.4, pp. 360-384.

Dawson, C. 2009, *Introduction to Research Methods, A practical guide for anyone undertaking a research project,* How to Books Limited, Oxford, England.

Dobson-Rumble, C. 1991, 'The "human element" approach to decision making…let's try reorganisation' SIGUCCS '91, *Proceedings of the 19th annual SIGUCCS conference on user services.*

Drever, E. 1995, *Using Semi-Structured Interviews in Small-Scale Research,* SCRE Publication 129, University of Glasgow.

EU Commission DG for Energy and Transport, 2010, *Inspiring Passenger Ship Safety*, EU Commission DG for Energy and Transport, EU DG Energy & Transport Memo.

Gage, D.W. 1992, *Command Control for Many-Robot Systems*, Research paper Navy Command, Control and Ocean Surveillance Center Division 531 RDT&E San Diego, CA 92152-7383, USA.

Gelling, L. & Munn-Giddings, C. 2011, 'Ethical review of action research: the challenges for researchers and research ethics committees', *Research Ethics,* vol. 7, no.3, pp. 100-106.

Grabowski, M. & Sanborn, S.D., 2001, 'Seeking the Human Element: Decision-making and Problem-solving Capacity in New Computer Systems', viewed 15 July 2015. http://voices.yahoo.com/seeking-human-element-decision-making-problem-453990.html?cat=15

Gratch, J, 2000. 'Modelling the Interplay Between Emotion and Decision Making', Papers for the 9th Conference on Computer Generated Forces and Behavioural Representation, Orlando, FL, 2000.

Hartson, F. 1989, 'User-interface management control and communication', *Software,* vol. 6, Issue 1, pp. 62-70.

Harris, C.J. & White, I. 1987, *Advances in Command, Control and Communications Systems,* Peter Peregrinis Ltd, London UK, except chaps. 6.2 & 7.4 Crown Copyright.

Helsloot, I. 2006, 'Bordering on Reality: Findings on the Bonfire Crisis Management Simulation', *Journal of Contingencies and Crisis Management,* vol. 13, Issue 4, pp. 159-169.

Herring, J. 2012, *How to Decide What to do when you don't know what to do,* Pearson Education Limited, Harlow, England.

Herzfeld, C.M. 1978, 'Command, control and communications', *The Adelphi Papers,* vol. 18, Issue 145, pp. 40-43.

Hsu-Shih, S. Liang-Chih, H. & Huan-Jyh, S. 2005, 'Recruitment and selection processes through an effective group decision support system (GDSS)*', Computers and Mathematics with Applications ,* vol. 50, Issue 10-12, Nov-Dec 2005, pp. 1543-1558.

Kaempf, G.I. Klein, G. Thordsen, M.L.& Wolf, S. 1996, 'Decision Making in Complex Naval Command-and-Control Environments', *Human Factors: The Journal of the Human Factors and Ergonomics Society,* vol. 28, no. 2, pp. 220-231.

King, R. 2010, 'Command Failures in Afghanistan…Unresolved and Unpunished', viewed on 12 July 2015, http://www.military.com/news/article/army-revokes-punishments-in-wanat-firefight.html

Leonard, R.R, Buchanan, T.,Hillman, J.L, Nolen, J.M & Galpin, T.J. 2010, 'A Concept for Command and Control', *Johns Hopkins APL Technical Digest,* vol.29, no. 2.

Levchuk, G.M. & Levchuk, Y. 2006*, Identifying Command Control and Communication Networks from Interactions and Activities Observations,* CCRTS-2006, Aptima Inc. Woburn, MA 01801, USA.

Ministry of Defence, 1989, *Military Aid to the Civil Community: A Pamphlet for the Guidance of Civil Authorities and Organisations*, 3rd edition: AC 6042l.

Munn-Giddings, C., Hart, C. & Ramon, S., 2005, 'A participatory approach to the promotion of well-being in the workplace', *Lessons from empirical research,* vol.17, no.5, pp. 409-417.

Munn, P. & Drever, E., 1990, *Using Questionnaires in Small-Scale Research,* SCRE Publication 104, University of Glasgow.

O'Neill, J. 1996, 'The Role of Problem-Solving in C3I Systems', *Proceedings of Second International Symposium on Command and Control Research and Technology*. (Market Bosworth, Warwickshire, UK, 1996), pp. 348-355.

Orr, G.E. 1983, 'Combat Operations C^3I Fundamentals and Interactions', *Airpower Research Institute, Air University Press, Maxwell Air Force Base, Alabama, USA.*

Organ, D.W. 1997, 'Organizational Citizenship Behaviour: It's Construct Clean-Up Time', *Human Performance,* vol 10, no. 2, pp. 85-87.

Pearce, T. & Fortune, J., 2006, 'Command and Control in Policing: A System Assessment of the Gold, Silver, and Bronze Structure', *Journal of Contingencies and Crisis Management,* vol. 3, Issue 3, pp.181-187.

Pohl, J., 2008, *Cognitive Elements of Human Decision Making,* Published in 2008.DOI: 10.1007/978-3-540-76829-6_2.

Pohl, J., 2008, '*Elements of Human Decision Making*', Papers for the InterSymp-2006, Baden-Baden, Germany, August 7 to 12, 2006. [RESU88]**.***Studies in Computational Intelligence*, vol. 97, 2008, 00 41-76.

Punch, K.F., 2012, *Developing Effective Research Projects,* Second ed., Sage Publications Limited, London, England.

Quarantelli, E.L, 1988, 'Disaster Crisis Management: A Summary of Research Findings', *Journal of Management Studies,* vol. 25, Issue 4, pp. 373-385.

Roberts-Greenfield, K., 2012, '*Barak Obama: A Failure To Command – And Respond*', Center of Military History Department of the Army, Washington DC.

Schön, D.A. 1991, *The Reflective Practitioner, How Professionals Think in Action,* Paperback edition, Arena, Ashgate Publishing Limited, Surrey, England.

Schwabel, J. 2007, *Command, Control, Coordination, and Cooperation During Defense Support to Civil Authority Operations*, US Army War College, Carlisle Barracks, Carlisle, PA, 17013-5050, Strategy Research Project.

Shaw, A.D. 1980, 'Command, Control and Communications', in *Scientia MilitaRIA – South African Journal of Military Studies,* vol.10, no.3

Simon, H.A. 1960.*The New Science of Management Decision*, New York, NY: Harper and Row.

The Office for Human Research Protection (OHRP), 2004, '*Human Subject Regulations Decision Charts,* September, 2004.

Thomas, J. & Harden, A. 2007, *Methods for the thematic synthesis of qualitative research in systematic reviews,* ESRC National Centre for Research Methods, NRM Working Paper Series, no. (10/7), viewed on 23 June 2015, http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=188

Wohl, J.G. 1981, 'Force Management Decision Requirements for Air Force Tactical Command and Control', *Systems, Man and Cybernetics,* vol. 11, Issue 9, pp. 618-63.

Annexes

Annex A – PWI Breakdown

Business School: Professional Practice Programmes

DProf by Public Works – Public Works Inventory

Name: …John Astbury……. **Date: February 2012 (updated October 2012)**

ID	Work (Title)	Description	Originator(s)	R&D Method(s)	Evaluation(s)	Impact(s)
1.	Enhancing the national capabilities in responding to, and the management of, a crisis and disaster in the field of maritime casualties: passenger ships and vessel accidents.10-13 December 2007Alexandria Egypt at the Arab Academy of Science, Technology and Maritime Transport (14000 words including annexes)	Presentation and report on proposed maritime contingency arrangements in Alexandria, Egypt to Egyptian government bodies in Egypt following the loss of the ferry Al Salam Boccaccio in the Red Sea in February 2006 with the loss of 1015 lives.	John Astbury (lead and author), supported by Robin Middleton.	Analysis of Egyptian government structure and culture, in particular maritime history and organisation. Research into the loss of the Al Salam and its background including response mechanisms and systemic failures. Research into the UK approach to maritime contingency arrangements and suitability for Egyptian read-across.	Report submitted to, and accepted by, the IMO then on to the Egyptian government for consideration and follow-up.	Important consideration of changes to maritime contingency arrangements and planning.

2.	Establishment of UK Maritime Incident Response Group (MIRG) MIRG Web Site In January 2003 the MCA launched the 'Sea of Change Project'. This project culminated in the formation of the UK Maritime Incident Response Group (MIRG) that actively contributes to maritime & civil resilience. (approx 6,000 words)	**The MCA Maritime Incident Response Group** To address the issue of further improving maritime resilience and delivering a more formal approach to dealing with incidents of fire, chemical release and industrial accidents on vessels/structures 'at sea', the United Kingdom's Maritime and Coastguard Agency (MCA) has entered into partnership with 15 coastal Fire & Rescue Services around the UK.	John Astbury (originator and author) Mervyn Kettle Peter Pearce	Identification of incidents/location/types around the UK to establish strategic locations/composition of teams and appropriate equipment – some developed specifically for the MIRG Teams as none existed.	Sea of Change project submitted to Secretary of State for Transport Alistair Darling and accepted for funding of £2.5M per annum and annual contribution by Chief Fire Officers Association (by all UK Fire Services)	UK response to fire-fighting on ships at sea established as the only one in the world. Major contribution to saving of life and value to the Exchequer.
3.	*HM Coastguard: Five Year Strategy (A document for consultation)* (January 1998); following Focus for Change Review of HM Coastguard & *HM Coastguard Five Year Strategy, Consultation: Analysis of Responses*, Operational Research Unit of the MCA, 26 March 1998 (approx 5000 words)	On 17 November 1997 the Government announced a new Five Year Strategy for HM Coastguard. Substantial investment would be made in new communications equipment, improving "the effectiveness and efficiency of an already highly proficient Service". This enhanced efficiency would allow a number of maritime rescue co-ordination centres to close down: two rescue sub-centres, at Oban and at Pentland, in Orkney, would be closed by the end of 1999, followed by those at Tyne Tees and at Liverpool by the end of 2000. Portland and Solent would be co-located by March 2002.	Author: John Astbury	A detailed analysis of Coastguard operations over a 6 month period including local visits and interviews with over two-thirds of coastguard personnel. The most thorough of it's kind, resulting in a document : Focus for Change.	Considered by Ministers and several Transport Select Committees and finally, at the request of the Deputy prime Minister, a review by Lord Donaldson of Lymington (former master of the Roles). The outcome was acceptance by the proposals with very few changes.	Closure of three Coastguard Co-ordination centre and the introduction of modern communications equipment and enhancing the response to life-saving at sea. Laid foundation for future improvements.

4.	MSC Napoli Incident January 2007 – A compendium of situation reports, ministerial briefings and parliamentary speaking notes. (approx 7000 words)	On Thursday 18 January 2007 the container ship MSC Napoli sent out a distress signal after getting into difficulties in the English Channel. The 62,000-tonne vessel took in water through a hole in its side and the crew were forced to abandon ship. Salvage efforts over the following few days didn't go to plan and the ship had to be beached off the East Devon coast. What followed was an extraordinary catalogue of events as her cargo spilled onto local beaches around Branscombe, Devon, UK.	Author: John Astbury	Thorough understanding of Maritime Command and Control and the practical application of maritime legislation to maritime accidents, in particular use of the Secretary of State's Powers of Intervention and the Merchant Shipping Act 1997 (as amended) and Maritime Security Act 2000 (as amended). Research into the design and architecture of the ship together with pollutants and other dangerous cargo. Research into local topography and bathymetry and suitability for salvage operations.	Political, environmental and social evaluation through media, parliament and public opinion.	Prevention of a major environmental disaster in the English Channel and along the UK and French coasts by timely and high risk/ maximum gain strategy.
5.	Work on MT Prestige Maritime Pollution Incident for Ince & Co International Law Firm – Expert Witness (approx 40,000 words)	Expert witness Report for Ince & Co International Law Firm in defence of prosecution of Mare Shipping Greece (Prestige owners) in Spanish Courts.	Author: John Astbury	Extensive literature research & understanding of major maritime emergencies and C4 in Spanish arena.	Political, social and operational evaluation of Spanish approach to major maritime emergencies.	Potentially significant impact on outcome of legal process in Spain and cost occurred by owner of Prestige – case worth in region of $6bn.
6.	Proposal for Joint Rescue Co-ordination Centre (JRCC) Qatar (approx 4000 words)	Submission to the Qatar Air Force for the design of a new JRCC in Doha to accommodate SAR controllers for the SAR Region.	John Astbury Tim Parker	Understanding of the policy, procedures and protocols prevailing in Qatar and the detailed SAR and security operational requirements for the region.	Acceptance by the Qatar Government Steering Committee	Establishment of the first JRCC in the Middle-east, enhancing co-ordination of SAR and security incident in the region leading to improvement in life-saving and coherence

						of command, control and communications.
7.	SOSREP for the Multi-tank Ascania emergency – Various internal reports.	On 19 March 1999 the Tuvalu registered chemical tanker Multitank Ascania was carrying its cargo of 1750 tonnes of vinyl acetate from Eastham on the Manchester Ship Canal to Teesport through the Pentland Firth in Scotland. A fire broke out in the ship's boiler room and a distress call went out in the small hours of the morning.	John Astbury: SOSREP and Director of Maritime Operations MCA	Understanding and evaluating the revised policy under SOSREP for the handling of major maritime incidents and the policy for salvage and intervention.	Political and operational evaluation of revised approach to major maritime operations following an government review by the Lord Donaldson of Lymington.	Confirmation of th revised policy and approach and the formal establishment of the SOSREP post.

Annex B – Survey Questions

1. **Where are you based (Country)?**

2. **What area of emergency operations do you work in?**

   a. Police
   b. Fire
   c. Ambulance
   d. Emergency Support Services (e.g. Red Cross, Local Authority)
   e. Coastguard
   f. Lifeboat Rescue
   g. Other Rescue Organisation (e.g. Cave, Mountain, Dive)
   h. Other (please specify)

3. **What is your age?**

   a. 18 to 24
   b. 25 to 34
   c. 25 to 44
   d. 45 to 54
   e. 55 to 64
   f. 75 or older

4. **What is your gender?**
   a. Male
   b. Female

5. **How longed have you worked in emergency operations?**

   a. <5 years
   b. >5<10 years
   c. >10<15 years
   d. >15<20 years
   e. >20<25 years
   f. >25 years

6. **How many times a year do you (or have you) handle(d) major emergencies in your field of operations? (a major emergency is any emergency that involves multiple casualties, major damage to buildings/community infrastructure (describe below). You may use your own organisation's definition of a major emergency.**

   a. <5
   b. >5 <10

c. >10 <15
d. >15 <20
e. >20 <25
f. >25
g. Describe your own definition of a major emergency:

7. Do you take overall command of major emergencies?

a. Yes
b. No

8. If you answered yes to the above question: For all types of emergency (major and minor) describe in general the emergencies you have handled – one or two examples only.

9. How important do you believe operational experience of your field to be in leading a major emergency (Note: you do not have to have led a major emergency to answer this question).

a. Essential
b. Very important
c. Reasonably important
d. Not so important
e. Not important at all
f. If you have ticked any of the first four options, how many years operational experience do you think is necessary? (please specify)

10. In your opinion, how important is a pre-determined plan, process or set of principles to the successful outcome of a major emergency?

a. Essential
b. Very important
c. Reasonably important
d. Not very important
e. Not important
f. I think its best just to be totally flexible and don't agree with pre-determined plans

11. Do you regularly consult a plan, process or set of principles during a major emergency?

a. Always
b. Mostly
c. Occasionally
d. Not at all.

12. Do you consult a plan at the end of an emergency or shortly afterwards to check if you followed it correctly/took the right actions or simply to justify what you did?

a. Yes – Often
b. Yes – Sometimes
c. Not at all.

13. From your experience in dealing with emergencies in general, do you believe that consensus about the options for a successful outcome among the operations room team is important?

a. Vital
b. Important
c. Can be important (add your rationale in the comment box)
d. Not important at all
e. Don't know
f. Comment:

14. How would you rate the following qualities in a major emergency commander?[16]

Quality	Vital	V. Important but not vital	Important but not very	Not important
Charisma				
Authoritative				
Flexible				
Experienced				

15. How important do you think it is that potential recruits to emergency service operations rooms should be tested in some way to ensure suitability to take decisions in an emergency context before they are taken on?

a. Very important
b. Important
c. Somewhat important
d. Not important
e. Don't know
f. If you have a system to check potential recruit ability to take command please explain:

[16] Post Survey note: The definitions of the characteristics were not included in the questionnaire due to an oversight, but are defined in Chapter 5, paragraph 5.5